



PROMOTING LIFELONG
HEALTHY EATING HABITS



Setting up and running a school garden

A MANUAL FOR TEACHERS, PARENTS AND COMMUNITIES



Front cover:

School children in China: R. Faidutti.

School garden in Panama: Jesús Bulux, Instituto de Nutrición de Centro América y Panamá and Pan American Health Organization.

Vegetables and fruit: Mel Futter.

Back cover:

Ethiopian children: R. Faidutti.

Illustration: Mel Futter.

Design:

J. Morgante/R. Magini.

Setting up and running a school garden

A MANUAL FOR TEACHERS, PARENTS AND COMMUNITIES

**Food and Agriculture Organization of the United Nations
Rome, 2005**

Disclaimer

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The conclusions given in this report are considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

ISBN 92-5-105408-8

All rights reserved. Reproduction and dissemination of material in this information product for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material in this information product for resale or other commercial purposes is prohibited without written permission of the copyright holders.

Applications for such permission should be addressed to the Chief, Publishing Management Service, Information Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00100 Rome, Italy or by email to copyright@fao.org

© FAO 2005

Foreword

The keys to the development of children and their future livelihoods are adequate nutrition and education. These priorities are reflected in the first and second Millennium Development Goals. The reality facing millions of children, however, is that these goals are far from being met.

Children who go to school hungry cannot learn well. They have decreased physical activity, diminished cognitive abilities, and reduced resistance to infections. Their school performance is often poor and they may drop out of school early. In the long term, chronic malnutrition decreases individual potential and has adverse affects on productivity, incomes and national development. Thus, a country's future hinges on its children and youth.

Investments in nutrition and in education are essential to break the cycle of poverty and malnutrition. FAO believes that schools can make an important contribution to countries' efforts to overcome hunger and malnutrition, and that school gardens can help to improve the nutrition and education of children and their families in both rural and urban areas. In this regard, it is important to stress that school gardens are *a platform for learning*. They should not be regarded as bulk sources of food or income, but rather as a way to *better nutrition and education*.

FAO encourages schools to create learning gardens of moderate size, which can be easily managed by students, teachers and parents, but which include a variety of nutritious vegetables and fruits, as well as occasionally some small-scale livestock such as chickens or rabbits. Production methods are kept simple so that they can be easily replicated by students and parents at their homes.

Food systems are the unifying concept. "From plot to pot", students learn how to grow, tend, harvest and prepare nutritious seasonal produce, in the educational settings of the classroom, the garden, the kitchen, the school cafeteria and the home. The experience promotes the environmental, social and physical well being of the school community and fosters a better understanding of how the natural world sustains us. Links with home gardens reinforce the concept and open the way for the exchange of knowledge and experience between the school and the community.

Such food-based strategies have the merit of sustainability: they create long-term dietary habits and put food choices into the hands of the consumer. A strong education component ensures that the effects go beyond the immediate time and place, to children's families and future families.

Nutrition concerns also link the developed and the developing worlds, which share many dietary problems. For example, the need to change perceptions of fruits and vegetables and to learn how they are best grown, prepared and eaten is common to many communities, rich and poor, and may be critical in building community health in both. This makes for meaningful joint efforts and exchanges of experience, ideas and teaching materials.

FAO has prepared this Manual to assist school teachers, parents and communities. It draws on experiences and best practices of running school gardens all over the world. Classroom lessons are linked with practical learning in the garden about nature and the environment, food production and marketing, food processing and preparation and making healthy food choices.

We hope that the Manual will be a useful tool for all those who wish to start or improve a school garden with the aim of helping school children to grow in both mind and body.



Kraissid Tontisirin,
Director,
Food and Nutrition Division



Mahmoud Solh
Director,
Plant Production and Protection Division

Acknowledgments

The Manual and accompanying materials were prepared by the Nutrition Programmes Service of the Food and Nutrition Division in consultation with the Crop and Grassland Service of the Plant Production and Protection Division in FAO.

Ellen Muehlhoff of the Food and Nutrition Division had overall responsibility for developing and guiding the preparation of this publication. She also served as technical editor. Alison Hodder of the Plant Production and Protection Division advised on the horticultural sections. Special thanks are due to Jane Sherman, who is the main author of this text. Her expertise in education and experiential learning and her writing skills are highly appreciated. Chris Landon-Lane's broad experience in horticulture and practical approach to small-scale gardening enriched the horticulture sections and fact sheets.

Substantial technical contributions were provided by Jennifer Heney of the Agricultural Support Systems Division in FAO. Valuable comments and contributions were also received from: Fiorella Cerruti of the School Feeding Service, World Food Programme (WFP); Lavinia Gasperini of the Research, Extension and Training Division; Corinna Bothe, Fintan Scanlan and Alberta Mascaretti of the Field Operations Division; and Hitomi Sato of the Plant Production and Protection Division.

We would also like to express our very special appreciation to all the head masters and mistresses, school teachers and educators in different parts of the world who made this publication possible, in particular:

Buzz Bezuidenhout, BMW SEED (School Environmental Education Development) Programme, South Africa

Asha Choday, head teacher, Maranda School, Kenya

Jackie Greenhouse, head teacher and Linda Carr, garden manager, Manorbier School, Wales, UK

Patrick Lloyd-Lister, group health educator, Harmony Gold Mine, South Africa

Mark Miller, project coordinator, Gate Project (Garden-based agriculture for Toledo's Environment), Jamaica

Sylvester Ncube, head teacher, Nebiri School, Zimbabwe

Claudette Power, head teacher, and Miss James, garden manager, Sligoville School, Jamaica

Charles Ssekyewa, senior lecturer in Agriculture and coordinator of Seeds for Africa school gardens project, Martyrs University, Uganda

Simon Zayo, garden master, Negande School, Zimbabwe

We thank the community of Komga, South Africa, for their support and enthusiastic contributions to the photos and final preparation of the book, especially Errol Muller of Komga Market, Ronel Vorster and staff of the East Cape Co-op, the children of Draaibosch, the Flannigan family and Government Kobese.

Further acknowledgments are due to Brett Shapiro and Rosemary Allison for editing and proofreading. Mel Futter was responsible for design and layout, and unless otherwise stated within the publication, provided all photography and illustration.

CONTENTS

INTRODUCTION	vii
PART 1: WHAT DOES IT INVOLVE? <i>Running a garden project</i>	1
PART 2: WHO WILL HELP US? <i>Involving the family and community</i>	9
PART 3: WHAT IS OUR GARDEN FOR? <i>Aims and principles</i>	19
PART 4: WHERE DO WE START? <i>Raising environmental awareness</i>	31
PART 5: WHAT DOES OUR GARDEN NEED? <i>The garden site</i>	39
PART 6: WHAT SHALL WE GROW TO EAT? <i>Improving nutrition</i>	49
PART 7: WHAT SHALL WE GROW TO SELL? <i>Market gardening</i>	63
PART 8: HOW DO WE GROW THINGS? <i>Gardening methods</i>	77
PART 9: HOW WILL WE EAT OUR GARDEN FOOD? <i>Preparing, processing, promoting</i>	89
PART 10: WHAT'S THE PLAN? <i>Planning the project</i>	99
PART 11: HOW DO WE GET GOING? <i>Organizing the work</i>	109
PART 12: HOW DO WE KEEP GOING? <i>Motivation and ownership</i>	119
 APPENDICES:	
Food factsheets	127
Nutrition factsheets	163
Horticultural notes	177



INTRODUCTION



The importance of school gardens

Many believe that learning at school happens only inside the classroom. Now we recognize that the whole school environment is involved in children's development. The school grounds are:

- a source of food for improving children's diet and health;
- a source of healthy influences (clean drinking water, physical activity, hygienic latrines, washbasins, school meals);
- an area for learning (about nature, agriculture, nutrition);
- a place of pleasure and recreation (flowers and shrubs, play areas, shade, eating areas);
- a continuing lesson in respecting the environment and taking pride in one's school.

Tarmac, dry earth, mud and empty fields are turning into green grounds, outdoor laboratories, vegetable plots, herb gardens, play spaces and study areas. School gardens are leading this change.





Tyre gardens A child-size garden can be made in a car tyre cut in half. Fill it with soil and a little chicken manure and plant vegetables. Heat from the sun warms the tyre and helps the plants grow. Each tyre garden needs only a litre of water a day. Children can protect their gardens from animals by bringing them near to the house.



(P. Lloyd-Lister, personal communication, 2003)

Mandela's garden

While Nelson Mandela was a prisoner in South Africa, he spent hours every day gardening. He grew vegetables, often in oil drums cut in half. At one time he was looking after about 900 plants. In this way he improved his own diet and the diet of other prisoners – and also that of his white warders!

(Mandela, 1994)

THE SCHOOL GARDEN MANUAL

The School Garden Manual is based on experiences of setting up and running school gardens all over the world.

Who is it for?

The Guide is for anyone who is interested in starting or improving a school garden, in particular for growing good food and for learning to market garden products. You may be a teacher, a garden manager, a group of teachers, parents and community members from one school or from several different schools.

What is the age range?

The intended age range of pupils is 9 to 14. "Younger pupils" means pupils aged 9 to 11, and "older pupils" 12 to 14. This is not to say that children outside this age range cannot be involved; there is always something for very young children to do, and senior students can of course lend a hand with all kinds of task, including managing the work.

What does it consist of?

The Manual takes you through all the steps of planning a garden project: deciding what your garden is for, planning how to get help and learning how to prepare the site. There are sections on organizing the work, and motivation has a separate chapter. In the appendices there are horticulture notes and factsheets on nutrition and on some widespread crops. N.B. The Manual does not aim to give detailed horticultural advice for all situations. For this you will need to consult local experts. In each part there are also:

- tips for action, including ways of involving children, families, helpers and community
- suggestions for outputs such as reports and posters.

The lesson outlines

Parts 3 to 10 have outlines of appropriate lessons to do in class. These are aimed at ages 9-14 and supplement and support gardening activities. They focus not only on knowledge and skills, but also on awareness, life skills, attitudes and routine behaviour. Such "garden lessons" have enormous educational value. They bridge theory and practice, reinforcing classroom learning with hands-on experience and observation, and vice versa, and should have a regular place in the classroom timetable, in addition to gardening time.

How do you use the Guide?

We suggest this approach:

- Read through each part of the Manual, making a note of what is important for your situation.



- Look through the suggestions and tips at the end of the chapter.
- Draw up a gardening programme outline.
- Look through the related lesson outlines and select those which your classes need.
- Schedule the lessons. How you do this will depend on the stage you have reached in your garden programme. You may be preparing for next year, or just about to start a garden, or looking for ways to improve a garden you already have.

School gardens across the world

Children learn by doing Sligoville, a farming community, was the first free village in Jamaica after slavery was abolished. The all-age school has been called the “most environmentally aware” in Jamaica. The head teacher encourages the garden strongly because she believes that children learn by doing. Children gain skills they can use, teachers find new ways to teach, and everyone gets some delicious nutritious food. Most of the staff are experienced gardeners and there is an active parent-teacher association.

Each grade manages a small plot with a few crops such as carrots, corn and thyme. The older children have an acre with a variety of vegetables and rows of plantain, banana and cocoa. There are chickens, rabbits and goats. The garden

is completely organic. The children eat a lot of the garden food and take some home; some is cooked in the canteen and some is sold in the community. Each year a cross-curricular project focuses on one food. One year they researched corn, grew samples, and produced songs, puppets and poems. Their book “Corn in the Classroom” was translated into 84 languages and featured on the radio. (C. Power, personal communication, 2003; Bruce, 1998)



Photo courtesy of Claudette Power, Sligoville school, Jamaica

AIDS orphans help themselves



In northern Zambia’s Mansa township, the Seventh Day Adventist church opened a small orphanage for AIDS orphans, with support from the Rotary Club and the Zambian Government. To provide the children’s food, they established a half-hectare garden which the children cultivate themselves under the supervision of a qualified volunteer gardener.

A small grant from FAO provided seeds, tools and a small-scale drip irrigation system. Now, under the children’s careful tending, the garden is flourishing, producing eggplants, peas, maize, green peppers, soybeans, sweet potatoes, tomatoes and chickens. “They are completely self-suffi-

cient for vegetables, maize and poultry,” says Karel Callens, an FAO nutritionist. “They are producing enough surplus to sell at market and are reinvesting the proceeds in the garden.” The children are also learning teamwork and farming know-how, which will support them for the rest of their lives. “That’s a pretty impressive return on a small investment,” says Mr Callens. (FAO Telefood, 2004a)



School gardens transfer knowledge and practice to children's homes



In Trincomalee in Sri Lanka, food insecurity was a severe problem after civil unrest and war. Agricultural clubs were formed in the schools, consisting of eight students and a teacher. Basic agricultural training was given by the Department of Agriculture. Vegetable plant nurseries and school gardens have been established on the school premises and the vegetable seedlings are sold to households.

Knowledge and practice are transferred to the home: students grow their own seedlings at home and pass on information about how to grow them to friends and family. Students report that they have gained knowledge, practical skills and opportunities for self-employment. (Wanasinghe, 2003)

Variety of activity, variety of learning Manorbier School in Wales, UK is in a depressed area with high unemployment. Although it is a rural area, many of the children have their first experience of growing things at school. The school garden has herbs, flowers, a play area, a large apple tree, a small wood and a pond for studying wildlife. It grows beans, tomatoes, sunflowers and leeks (the Welsh national emblem).



The whole school has created a pebble mosaic at the entrance, with a segment for each class. The idea is that the garden belongs to the children and they should run it. Children volunteer to be "garden monitors" for the week. Each class has a responsibility – e.g. the pre-school class looks after flowers, older pupils see to the pond. A garden club meets once a week after school. The garden is used for learning by direct experience in science and environmental studies, maths, literature and art. (J. Greenhouse and L. Carr, personal communication 2003)



PART 1: WHAT DOES IT INVOLVE?



Running a garden project

Objectives

- Discussing preliminary questions
- Reviewing the secrets of success





1. What does it involve?

Three school garden skills

"You need to know only three things to run a successful school garden:

- 1) How to cultivate people,
- 2) How to cultivate plants, and
- 3) Where to go for help."

(Guy *et al.*, 1996)

Running a school garden requires not only horticultural knowledge but also "people skills" and common sense. Other useful qualities are enthusiasm, organizational capacity and a flair for publicity. You need to plan and manage, find resources, get help and support, keep in touch with those involved, organize garden work and lessons, motivate people, and publicize garden achievements.

However, garden leaders do not have to do all this themselves. Good garden management means building up the school's capacity until the garden can almost run itself. Older

pupils show younger ones what to do; routine tasks are carried out automatically; helpers see for themselves what needs to be done.

A. PRELIMINARY QUESTIONS

Here are some questions that are frequently asked.

1. Who will be responsible for the garden?

The "garden leader" or "garden manager" may be a school principal, an experienced teacher or an experienced gardener from the community. She or he should be backed by a small team who between them have commitment, interest, experience, authority and contacts: for example, the head teacher, some parents or community members, a few students, a school inspector, a health worker, the school caretaker. Later a wider network of helpers and supporters can be built up.

The garden leader should have a colleague who can act as a deputy when necessary. It is also a good idea to establish an executive team of senior students who are able to carry on without much supervision.



2. What will we need?

Starting needs are discussed in Part 5. For tools and equipment, seeds and seedlings, the cost need not be high. If you start small they can be acquired over a few years. Often equipment can be borrowed, and sometimes you can save your own seeds. Local plant varieties, adapted to the local climate, are cheaper as well as safer. Organic approaches cut the cost of fertilisers and insecticides.



One expensive item is a secure garden shed. Even more important, and sometimes costly, are water and fencing. You must be able to irrigate your crops and protect them from predators. You may be able to get a grant for this kind of investment from charities, sponsors, government or aid organizations. But remember that pumps, pipes and fences

need maintenance. If you have no regular funding, the garden needs to make enough money to cover its costs.



3. How big will the garden be?

Your garden could be anything from a window box to a field. The size will depend on the space available. If the school does not have suitable grounds, there may be space in a community garden, or on waste ground along the road.

Size also depends upon your aims (discussed in Part 3). If education is your main purpose, it will not matter if you do not have much space. A few plants are enough for experimental observations (for example, studying germination). A single bed 1 m x 2 m will produce token quantities of food. Three or four small beds can make up a model kitchen garden for demonstration purposes. You will need much more space if you want to produce a significant quantity of food or do professional agricultural training.



Whatever your aims, you have more chance of success if you start small. You can always expand later. Even with a small garden, you will also have more success if you have a variety of crops, not just one or two.

4. How will we decide what to grow?

This depends on your aims (see Part 3). The main garden projects in this Manual are about growing food to eat and growing food to sell. In general, choose crops and trees that are adapted to local conditions, easy to cultivate and fit into the school term. Your crops should fit in with local food habits, be easy to prepare and have high nutritional value (for example green leafy vegetables and orange and yellow fruits and vegetables). In any case, children should be involved in deciding what to grow.

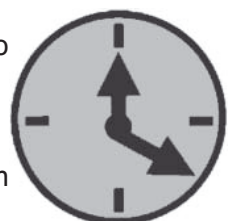


5. Who will do the work? Much of the work will be done by the children. They should be helped by volunteers (parents, community members, students, ex-students of the school) and by the school janitor/gardener/caretaker if there is one, especially for the heavier work (e.g. preparing the site).

But the bottom line is that children are learners and not a labour force. They must enjoy their time in the garden and learn from it. It should not be an unpleasant chore or punishment. The garden should also give children opportunities to take responsibility, make decisions, plan, organize work, collaborate, evaluate and publicize. Class time should prepare for these responsibilities.

6. How much time will it take?

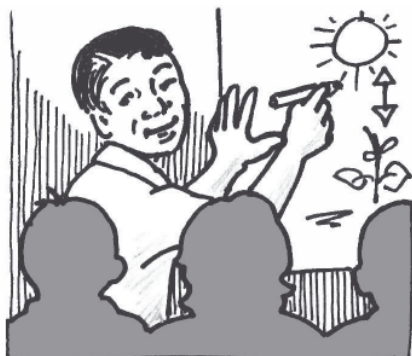
Class time Ideally, lesson time and garden time should be matched one to one. Lessons are for discussing and explaining, planning and organizing work, setting up experiments and observations, and documenting garden activities and events. To maintain a small garden and get full educational benefit, a class needs about an hour of garden time and an hour of lesson time per week, with a little "garden homework" in pupils' own time.





1. What does it involve?

Teacher time depends on the size of the garden. The job of garden manager is also very elastic! Apart from organizing garden work and lessons, and helping children, it can involve encouraging volunteers, setting up garden events, contacting sponsors, finding supplies, organizing tours, keeping accounts, writing reports and attending meetings. A good garden manager will delegate work to responsible pupils and to a garden support group.



7. What training do we need?

This depends on what knowledge and experience you already have. If possible, arrange for the head teacher and two or three others to have a training course in basic garden management, nutrition, organic gardening methods and project-based learning across the curriculum. Think about involving school cooks and caretakers too. Training can be organized by someone from the agricultural extension service, a knowledgeable parent, an NGO, or the education service.

Whoever receives training should pass it on to others – for example, in informal meetings. This reinforces the training,

spreads the knowledge and protects the garden programme from losing its only expert.

8. What support will we need?

- **Support from the school** Most important of all is to have a supportive head teacher and the interest of the whole school - the teachers, support staff (e.g. caretaker, cooks, secretary), the school council, school meals service, parent-teachers association and governing body.
- **Support from the local education authority** The active support of the local education authority is very desirable (although sometimes it may come only after you have established your garden!). They can put you in touch with special funds, organize inter-school competitions, give advice about management, recommend teaching materials, make timetable space for garden lessons and call on the health and agriculture sectors for technical support. They can also inform you of any special rules about managing funds or maintaining school premises. Persuade them to set up a network of schools with gardens and to facilitate exchanges between them (e.g. with visits and newsletters).
- **Support from the community** School gardens are very visible and attract local interest. They therefore do best when they have support and help from families and the community. Most schools are surrounded by experienced gardeners.
- **Support from Teachers Centres** Teachers Centres can help with resources (e.g. teaching materials, information about crops) and provide a place for schools to meet and exchange ideas.
- **Support from other services** Finally, you need good technical assistance from agricultural extension services, farmer field schools, the health service, NGOs, etc.



Keep all interested parties informed about what you are doing, and consult them frequently. Make the school garden a regular item on the agenda of school meetings.



9. How do we get people to feel positively about the garden?

Support depends on attitude. In some areas there is a long tradition of passionate home gardening. People want their children to learn the skills of growing food, flowers and trees. If gardening has this positive image in your community, you can build on it.

But often gardening is seen as just hard dirty work, not as education. At worst, schools may be accused of aiming to keep children tied to low-paid agricultural jobs. If this is the attitude, then one of your main tasks will be to change it. Many ways of giving the garden good publicity will be discussed in this Manual – for example, involving families, focussing on education, building a sense of pride and showing that gardening can improve our health and wealth. Your basic advantage in these efforts is that children find growing things and producing delicious food genuinely exciting and rewarding.

Support and success for disabled children

Divina Misericordia is a school for disabled children in Lima, Peru. The school has its own garden, which grows lettuce, beets, carrots and broccoli. Everyone was involved from the beginning: the director, the teachers, the students and some parents built the garden from scratch. When they started, there was nothing but sand and dirt. They cleaned it up, brought in soil and installed an irrigation system.

The school director Elvira Pacherrres says the children are passionate about the garden. "Gardening is now part of the curriculum and it works as therapy for these children. It shows them how easily they can have access to food if need be, and it gives them responsibilities. Often, these kids are put aside in the family... here they learn to contribute to the household. Some grow their own little gardens at home too."

(FAO Telefood, 2004b)

B. SECRETS OF SUCCESS

Some of the secrets of success are set out in the box below

Support

The school garden will thrive if it has support from:

- the local education authority;
- the head teacher/principal;
- all the school;
- the parents and community.

Involvement and contacts

It will help if you can:

- interest the local agriculture and health services;
- involve the community as experts, advisers, helpers, observers;
- interest the school meals programme;
- set up a support group of interested, active and helpful people;
- keep in touch with other schools that have gardens.



Sustainability

It's a good idea to:

- start small and expand later;
- establish (and maintain) a good water supply and fencing;
- know how the garden will be funded, or how it can pay for itself;
- use organic approaches to improve and conserve the soil;





1. What does it involve?

- choose crops which are adapted to local conditions, match local traditions and food habits, have high nutritional value, contribute to food security, are easy to cultivate and fit the school term;
- make sure there is a takeover garden manager in case of emergency or sickness;
- get trained and experienced teachers and helpers to pass on their knowledge.



Motivation

The project will work best if you:

- establish clear objectives agreed by all;
- choose garden managers who know how to handle people as well as plants;
- give praise, rewards, prizes and other incentives for children, teachers and helpers;
- publicize success and make garden activities visible to the public and the whole school;
- create pride, status, achievement and pleasure in the garden.

Educational value

Try to:

- explore attitudes in the community, families and children, and recognize their importance;
- fully recognize the garden as a learning experience and a learning tool;
- involve pupils in planning, decision making, organization and publicity;
- match garden work and classroom work one for one;
- link the garden to the mainline school curriculum;
- encourage observation, experimentation and record keeping.



Technical and pedagogic support

Do your best to:

- get access to information and good technical advice/support;
- get training in organic gardening approaches and garden management;
- find/make suitable classroom materials.



SUGGESTIONS FOR ACTION

- Consult the head teacher about the idea of a school garden.
- Decide who is to be the "garden leader".
- Find out how education authorities, health services, agricultural services and the local council can support the school garden, including funding possibilities.
- Explore the possibilities of training for school staff.
- Start informal discussions about a school garden with school staff, parents, the community and the school meals service. Write down ideas, and make a note of feelings and fears about garden work. Do not commit yourself yet to a particular aim or plan – keep the subject open.
- Ask the children! Find out what they think about gardens, gardening and garden food.

Outputs: Ideas for the school garden; notes on problems, risks and attitudes.



TIPS AND IDEAS

- Get artistic students to copy the "Grow with the Garden" poster below. Adapt it as necessary for your own context.
- Take photographs of possible garden sites.
- Visit home gardens in the neighbourhood for inspiration and ideas.
- Contact other schools with gardens.
- Start a Garden File for all garden documents.

The poster illustrates the wider concept of the garden:



NOTES

[illegible]

PART 2: WHO WILL HELP US?



Involving the family and community

Objectives

- Finding local support
- Establishing a Garden Group
- Maintaining support and interest
- Selecting publicity strategies





2. Who will help us?

What help can the community give?

"Look for people who can contribute any of the four W's - Wealth, Wisdom, Work or Weight (that is, influence)."

(Food Works Organization, 2004)

School gardens are much more successful when the community is interested and involved. And it is a good idea to involve them right from the start in planning and discussing the garden. This will build commitment, spread the workload, help you to avoid mistakes, and stimulate interest in the school's activities.

People may need convincing. Make your aims and principles clear to everyone from the very beginning. Above all, people should be able to see clearly that the garden is intended to benefit the children and the school as a whole – physically, educationally and psychologically.

A. WHO AND HOW

Here are some community elements that might be interested in the school garden. Which of them could be called on in your community? What could they contribute?



Parents and families Parents and families will become interested in school gardens if they can see the value for their children. Individual parents may act as volunteers, helping with garden work. Families can be a market for school produce. They can help with children's "garden homework", visit the garden and participate in talks, demonstrations, food fairs, celebrations or presentations.

Garden work can even be taken home, with families' agreement and help. For example, if the school does not have much space, children can learn about gardening at school but actually create their own gardens at home. Or they can plant copycat gardens at home, following the model of the school garden.

Make time to introduce the garden to as many families as possible. Invite them to visit and get children to take them round. Give them opportunities to discuss the garden and make suggestions. Listen to them and make use of their expertise and experience.

What individual volunteers can do



Organize field days, a garden clean-up day.

Build a garden shed, a fence, a wall.

Demonstrate gardening techniques, food preparation.

Provide transport, seeds, tools, recipes.

Help to cook, dig, weed, clear bushes.

Talk to the children about what they are doing in the garden.



Joint efforts



At our school parents sometimes give a day at the weekend for "bush-ing" (removing bushes, tree stumps, etc.). They are given a meal from the school canteen and some produce from the garden.



Changing attitudes

"In Kenya, manual work is likened to punishment. But this stigma is changing because our school has made a success of the garden. The children love the garden. They eat the food we produce and are visibly healthier. Parents shake us by the hand because they can see the difference. The garden has given the school a name. The District Education Officer brings visitors to see it."

(A. Choday, personal communication, 2003)

When there is heavy work to do, the garden manager organizes a "garden saddle" (*saddle* is a local word for bring-your-own-food). Everyone brings something to eat and when the garden work is done we put all the food together and we eat together.

Some parents might think their children should not get their hands dirty. It is best to deal with this attitude quietly, in the long term, just by giving status to gardening work and letting it be seen. Participate in the garden yourself, bring in well-known local people to endorse it, make the school known for its garden, and get the children to enjoy what they do and be proud of it.

Some parents cannot participate because they simply have too much to do, whether they are busy executives or overworked farmers. Get them to "invest" in the garden in very small ways – for example, donating a few seeds or some household rubbish for the compost heap. A contribution of any sort is a commitment.

The community Your local community, taken as a whole, certainly knows as much about gardening as you do! Looking at the human resources in your area will generally reveal a considerable pool of know-how. (Cederstrom, 2002)

- Identify well-managed home gardens near the school and get the help of gardeners. They may be willing to show children around, demonstrate techniques, or donate seeds, seedlings or cuttings.
- Find prominent local people who have gardens or make a good living from horticulture. Ask them to come and talk to school gardeners or to invite a group of children to their garden. This will raise the status of gardening in the eyes of children and families. If the speakers are ex-students of the school the effect is even greater!
- Persuade youth organizations such as scouts and sports clubs to give an afternoon for a big garden clearance. Offer an educational element and supply refreshments.



2. Who will help us?

In northern Mexico a school garden project invited successful local gardeners to act as trainers and educators for the school garden. In Bangladesh a school garden project appointed a village resident to manage the garden, and compensated her with a percentage of the proceeds.

(Cederstrom, 2002)

It may be possible to collaborate with community groups involved in other garden projects. For example, in some places:

- schools hand over part of the school garden site in return for help and support;
- community groups run poultry projects on the school grounds, or vegetable plots alongside the children's;
- women's clubs running vegetable gardens take over part of the teacher's role and show children what to do;
- the school garden is an extension of a community garden; in one project the community centre provided a field, a school garden manager and technical assistance to the school.

One hopes that the community can learn something from the school about growing good food, organic approaches or market gardening. If children take their learning home, everyone benefits. But be cautious about appearing to "instruct". Regard the community as a source of expertise, and recognize local practices that have stood the test of time.



School staff In the most successful school gardens, all the school staff are interested and lend a hand. Both teaching and non-teaching staff can contribute.

- The Home Economics teacher can advise on nutrition, food hygiene, food preparation and food conservation.
 - Business Studies teachers can give advice on sales, marketing and keeping accounts.
 - Other teaching staff may use the garden in their own teaching. Gardens are observatories, especially valuable for science, mathematics, environmental studies and technology, and a good stimulus for writing.
- Caretakers, janitors or school gardeners should be involved from the beginning. They know the school environment well, have practical know-how and are always on the spot.
 - School cooks should of course be consulted (see *The school meals service* below).

Where food is scarce, all school staff will be happy to have a share of the food produced. However, you may want to establish some ground rules – for example, that those who contribute most should have the largest share.



The garden can be an education in equity as well as in agriculture.

The local food industry

Farmers, market gardens and garden centres are often glad to give advice, information and demonstrations on horticultural techniques, marketing, storing and conserving food; to contribute seeds or lend tools; or to allow children to visit and observe. If the school meals service uses local produce, contact the producers, invite them to inspect your garden and hope for a return invitation. Local shops or markets can provide outlets for selling produce, and advise on sales and marketing. Local vendors may be glad to sell garden foods as snacks.



The school meals service If there is a school feeding programme, the school meals service should be involved in discussing what foods can be grown to improve the children's diet. There may be national nutrition guidelines or standards for school meals provided by the Ministry of Education or the Ministry of Health. If so, consult them.

School cooks should be consulted about what foods are easy to cook and what is needed to improve school meals. They are usually experts on what children are *willing* to eat – often a problem when you are trying to change dietary habits. They can also provide peel, old fruit or bones for the compost heap. If they have a food-handler's license, they can demonstrate food hygiene and food preparation to children and families. Try to include them in any training available.



Try to include them in any training available.

Other public-sector services Local agricultural extension workers, farmer field schools or environmental agencies can give technical information and advice, and possibly training courses on specific subjects. Try to get the interest of the health service, which can advise on food values, children's nutrition needs and nutritional guidelines for school meals. It is in their interest that children are well fed and healthy! The local council or the water authorities may help to build a well, install running water, advise on irrigation systems or help with rainwater harvesting.

NGOs, aid agencies, sponsors, charities, church groups

- Specialist NGOs may be able to help with funds, supplies, advice, information or education.
- Individual sponsors (e.g. local firms) are often glad to make a gift if they are approached courteously, understand the project and get a little favourable publicity for themselves.
- Local charities and church groups reach wide audiences. Appeal to them for voluntary help or donations (e.g. bottles for preserving, planks for garden signs, sawdust for paths). They make a good audience for talks about the school garden, and can spread the reputation of the school.

The media and publicity outlets This includes local newspapers and radio. It also means places where posters can be displayed or talks can be given – for example, the teachers' centre, the local clinic, the market, the cinema, local groups. Are there regular events (e.g. a science fair, a sports event, a college graduation day) where the school garden's successes can have a high profile?



"The primary schools in the region have a competition for best garden and for best garden plot. The prizes are awarded at the graduation day of our local university. The children go up to collect the prizes. They wear their best clothes and get very excited. It's a big event,"

(C. Ssekyewa, personal communication, 2003)



2. Who will help us?

Community support

These family and community contacts are set out in the table below. Use it to brainstorm what your own community has to offer.

	AS SUPPORTERS AND COLLABORATORS			AS A PUBLIC
How can the community be involved?	Expert advice/collaboration, information, interviews and demonstrations	Funding, sponsorship prizes, raising status	Help, facilities, supplies, outlets, equipment, publicity	Reached through articles, home-work, demonstrations, food fairs, guided tours
Community groups				
Parents and families	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
The community, the general public	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
School staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local food industry (e.g. cooks, farmers, shops, food services, vendors)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
School meals service	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Public sector services (agriculture, health, environment, local council and water authorities, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NGOs, aid agencies, charities, church groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local media and publicity outlets		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B. GARDEN GROUP

What kind of group can bring people together to support the garden? This depends on local communications, the school's relationship with the community, how people prefer to work (e.g. in groups or one-to-one), what groups already exist (e.g. parent-teacher association, school council) and how well they work, and the garden leader's own personal preferences.

Here are some of the possibilities. Which would work best in your situation?



- **Informal networks** in which garden leaders and children maintain personal contact with helpful and active people. This works well for garden managers who like socializing.
- A **"Friends of the Garden"** group that visits the garden regularly, is invited to garden events and meets formally once or twice a year with children and teachers to discuss how they can help.



- **A Garden Club** involving children, teachers and volunteers which meets once a week for work, discussion and refreshments.
- **A class-based parents' group** that helps with the activities of the children's class.
- **A formal committee** which meets once every month or two, and includes children, parents and representatives of the school, community, local council, public services (health, agriculture, education) and the school meals service.
- **Special working links** with local groups such as a Young Farmers Group, a youth group, a farmers association or a women's gardening club.

Once you have found community support, the secret is to hold on to it. Garden supporters need motivating as much as students and teachers (and garden managers). Take some tips from our section on motivation (Part 12).

C. HOW VISIBLE IS YOUR GARDEN?

Make your garden "visible" – give it a little publicity. This spreads the word about good gardening and good nutrition in the community, fosters a sense of pride, and shows that the school is active and cares. Gardens lend themselves particularly well to publicity because:

- they can be viewed (in guided tours and demonstrations);
- they have visible and edible products (which can be displayed and sampled);
- they are decorative and inspire good pictures (photos, drawings, maps and plans);
- they are easy to understand, for both children and adults.

Don't make grand claims about what you plan to do, but do not hide what you are doing.

Who should be told?

- Families should know about the overall garden plan, ongoing activities, produce and profit.
- The general public should see and hear what is being done at the school.
- The education service should be kept informed.
- Sponsors should know what has happened to their gifts.

Don't do all the work yourself! A lot of publicity work can be undertaken by children and helpers. Children especially should be involved in promoting the garden.

Use this checklist to decide which "visibility strategies" might work in your situation.

CHECKLIST

Garden identity

- Get pupils to choose a name for the garden and display it.
- Adopt a simple logo for your garden, or have a competition for one. Teach children to draw it. Put it on the poster, on your agendas for meetings, on school books, on children's homework, on food packages, on writing paper. Display it at garden shows.
- Try to make sure the garden looks good from every angle and is not hidden away in a corner.

Records and displays

- Make sure there are photos or drawings of all important garden events.
- Give someone the job of putting up a new picture/poster/news item about the garden every month in the school or in well-visited local places.





2. Who will help us?

- Display the Garden Poster in the school and public places, with an appeal for volunteers.
- Get the local newspaper/radio to run items on the garden and garden events (e.g. results of garden competitions), with pictures.



"How much money have we raised?"

- Show funds raised for the school garden on a "fund thermometer".
- Keep a Garden File or Yearbook to document the story of the garden. It can be shown to visitors and sponsors as well as to children and school staff. Include:
 - some background about the school and the school grounds, the children and their diet;
 - the story of the garden – how it was established and how the community participated;
 - what the garden produces and how it has developed;
 - children's writing;
 - plenty of drawings and photographs.

Visitors

- Invite the public to some garden events – e.g. demonstrations of preparing garden food.
- Encourage visitors. Display a weatherproof garden map showing people where to go and a garden calendar showing activities and crops.
- Invite prominent local people to visit the garden, and publicize the event.
- Get nurses/doctors from the clinic to endorse particular garden products as good for health.

Contacts

- Send home food samples, specially wrapped, with descriptive labels written by children.
- Ask parents to contribute something small (seeds? a bucket? a plant?), so they feel involved.
- Talk to some good gardeners near the school. Explain the garden project, invite them to see the garden site and say you will be grateful for their advice throughout the year.

Remember – pupils can do a lot of the publicity work

Everyone learns best by teaching!

For instance, they can:

- share garden homework with their families and keep families informed about garden events;
- design posters and prepare displays and presentations;
- make pictorial and written records of events (with drawings, photos, plans and maps) and contribute to the Garden File;
- signpost and label the parts of the garden;





- help with food preparation demonstrations;
- take visitors on guided tours;
- maintain the fund thermometer;
- write letters to schools or sponsors about the progress of the garden.

SUGGESTIONS FOR ACTION

- Brainstorm useful contacts in the community. Who would be interested? How can they help? Make a list and contact them.
- Decide what kind of support group would work in your situation, and set it up.
- Have a first meeting with the support group to discuss the value of a school garden, possible aims, scope and size. Keep a brief record in the Garden File.
- Think of some ways to promote the garden in the community.
- For future reference, take a look at the local media to see what they print/broadcast.

Outputs: List of possible community contacts and sponsors
Garden support group
Ideas for raising awareness in the community
Records of meetings

TIPS FOR SUCCESSFUL MEETINGS

- Get people to help with organizing the meeting.
- Find a comfortable setting (the garden, if possible).
- Meet regularly but not too often.
- Have small meetings.
- Include children and make sure they have a real role.
- Sit in a circle.
- Have a flip chart or blackboard so that ideas, decisions, etc. can be seen by all.
- Organize refreshments (from the garden, if possible).
- Have something about the garden on display to look at.
- Keep a short record of decisions taken and actions agreed. Read it out at the end.
- Set up networks – get each regular attendee to keep in touch with one or two others.
- Follow up the meeting with thanks and a notification of the next meeting.



NOTES

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

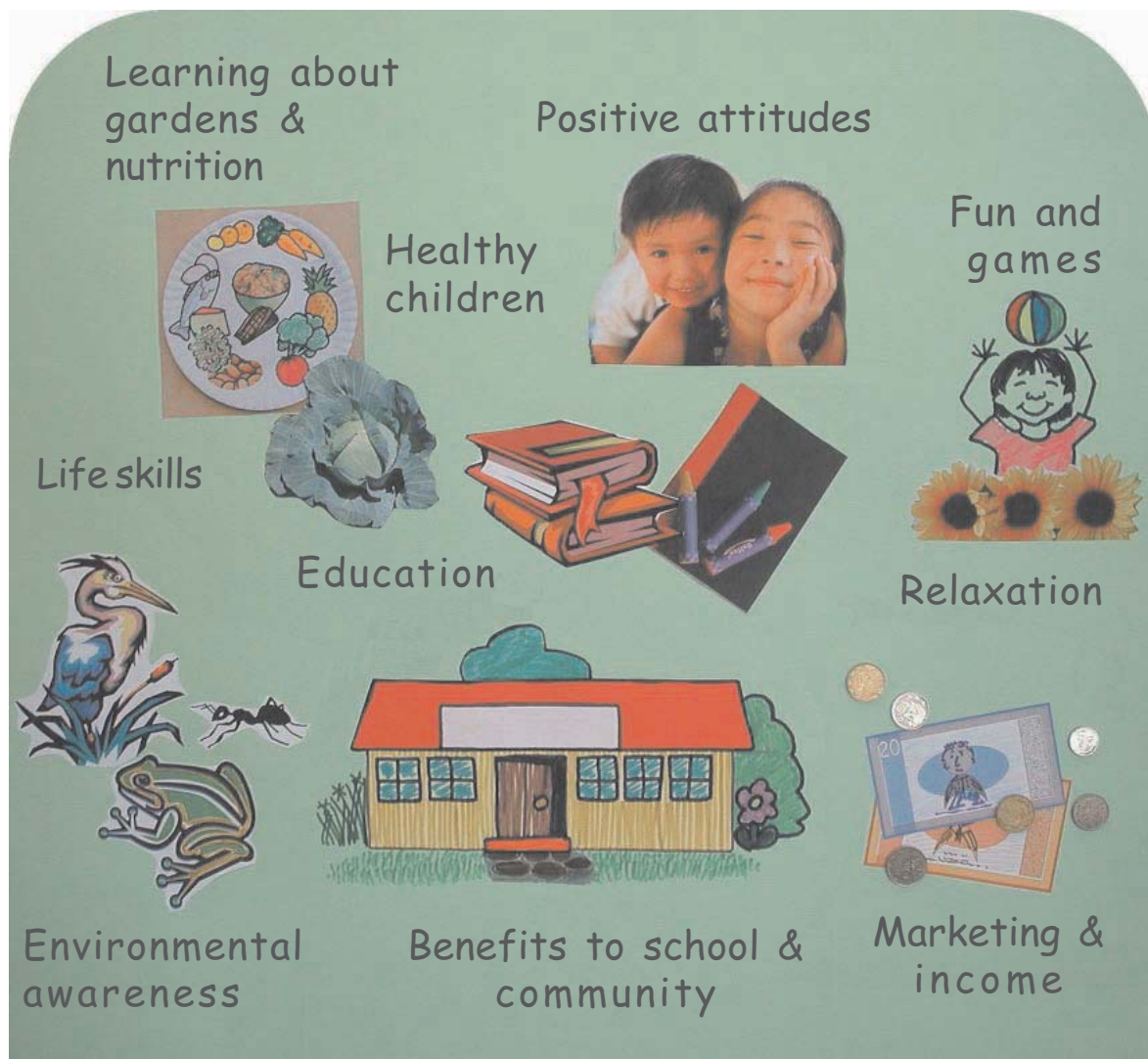
PART 3: WHAT IS OUR GARDEN FOR?



Aims and principles

Objectives

- Reviewing principles and priorities
- Choosing aims
- Writing a mission statement





3. What is our garden for?

Survival skills

"Gardens are good for schools because they teach children the skills for survival."

(S. Ncube, personal communication, 2004)

School gardens can have many different uses and have been seen in many different ways, some practical and some educational.

The table below divides the "practical" aims from the "educational" ones.

At first glance, which of these aims are your priorities and interests?

	PRACTICAL AIMS <i>The school's practical aims are:</i>	EDUCATIONAL AIMS <i>Children learn:</i>
GARDENING	to create a successful, sustainable garden using organic methods	how to grow things in a safe and sustainable way, and how to run their own successful gardens
		to enjoy gardening and have positive attitudes to agriculture
	to provide a model of a mixed kitchen garden for the community	to talk to families and community members about gardening practices
NUTRITION	to produce food for the school	how to grow food for themselves
	to improve children's diet with garden produce	how to improve diet and prepare healthy meals with garden produce
	to improve children's eating habits	to appreciate healthy foods and to change their own eating habits
MARKETING	to sell garden produce to get income for the school	business skills and entrepreneurship
ENVIRONMENT	to improve the school environment (trees/grass/paths/flowers, etc.)	respect for and interest in their school environment
	to collect rainwater, grey water; to encourage helpful insects; to prevent erosion, etc.	environmental awareness and understanding, respect for nature, natural resource management
SCHOOL SUBJECTS	to reinforce some areas of the school curriculum (e.g. science, environmental science, home economics)	particular subjects through active, hands-on experience
LIFE SKILLS	to help children survive and prosper in the world	how to plan, take decisions, collaborate, take responsibility, explain and persuade, etc.
SCHOOL AND COMMUNITY	to bring together school, children, families and community in a common endeavour	to relate to adults in various ways and to be aware of gardening practices in the community



Gardens produce funds, food and lessons in marketing, science and teamwork

Nebiri School is in a game reserve in the Zambesi Valley in Zimbabwe. The garden has mango trees, paw-paw, a lemon tree and areas with tomatoes, cabbage and other vegetables. A small grant provided a solar-powered electric fence to keep the big game out (though it doesn't deter the monkeys). Children bring in elephant and buffalo manure for the compost heap.

The garden provides funds for the school for stationery and equipment: the school sells the produce in the local market and to families at half price. Older pupils market the food and keep the accounts. Under the responsibility of the head teacher, the garden work is organized by a "garden team" of four pupils, which changes every month. Teachers use the garden as a learning resource for maths, biology and environmental science.

(S. Ncube and L. Chinanzvavana, personal communication, 2004)

A. THE LESSONS OF EXPERIENCE

Your school garden's aims may change and develop over time.

What is important is that they:

- are realistic;
- achieve a good balance between education and production;
- appeal to everyone (e.g. children, families, teachers, school staff, school meals service);
- are discussed and agreed by all the main participants;
- respect and protect children's rights.



Some lessons of experience are:

Aims succeed if they are what people want. Avoid imposing aims. Find out what people want and make your choices from these ideas.

The garden must benefit the children and be seen to do so. Food produced by the garden will be for the children, income will be for the school, education will be a clear priority.

School gardens can make a real difference to children's health. They can:

- give children nutrient-rich fruit and vegetables which are lacking in their diet;
- show children how to grow, prepare and eat them;
- encourage families to grow them too;
- help children to understand what makes a good diet;
- help children to like nutritious home-grown food;
- show children the link between what they grow, what they eat and how they feel.



Photo: Roberto Faidutti

School gardens can add nutritional value and variety to school meals, but they cannot feed the whole school! To produce enough food for that, children would have to work very long hours. This is not ethical or educational, and would certainly be very unpopular – with both children and their parents.¹

¹ Boarding schools and resident colleges – e.g. further education, teacher training – can usually produce more than normal schools. Some agricultural colleges are virtually self-sufficient in food.



3. What is our garden for?

Pride in the school comes first The most vigorous school garden projects take special pride in the whole school and its environment, as well as in the garden itself.

School gardens have many roles in the life of the school and community. They should be places where:

- it's good to play, work and study;
- many projects are carried out – e.g. studying bugs, building tables, measuring rainfall;
- people meet people – e.g. community members, parents, children, school teachers, cooks;
- events take place – e.g. selling snacks, staging dramas, holding demonstrations or food fairs;
- work is displayed – e.g. garden art, photos, drawings, maps, written accounts;
- everyone learns, including visitors and teachers.

Making income for the school is not enough Producing income may be an indispensable function of the garden, but it must be balanced by educational aims. Selling crops to make money should also have an educational dimension.



There may be negative attitudes to the garden Agriculture as an occupation and gardening as an activity may be seen as low-status, boring work. The school may need to work to change such attitudes and should start by discussing perceptions and objectives with all concerned.

Try to link garden work visibly to scholastic achievement in children's schoolwork and homework: don't leave reading and writing out of your garden programme!

Using the garden across the curriculum depends on the situation How far can the garden be integrated into the classroom curriculum? This depends on what subjects are offered (e.g. agriculture, environmental science, nutrition, business studies, home economics), how free teachers are to make their own way to established goals, whether cross-curricular project work is the norm,

and so on. Individual teachers can of course use the garden independently to reinforce their subject teaching, and the school can include this in its in-service teacher education programme.

"Educating the community" requires caution

The school must be sure that it knows enough to teach the community and that the community is prepared to learn from it. Until that time, think of "consulting" the community rather than "educating" it – for example, schools can encourage children to report at home what they're doing at school, invite families to visit the garden, create a model garden, distribute seedlings.

Schools should also learn from the community and make it clear that they are doing so.





B. PRIORITY AIMS

This Manual draws on the lessons of experience and promotes a *wide concept* of school gardens. In our view, school gardens should be seen primarily as a way of promoting healthy eating habits and good learning. They should not be seen *mainly* as sources of food or income, and especially not as a substitute for a school meals programme.

This Manual gives priority to:

- gardening for good nutrition and nutrition education;
- gardening and market gardening for learning;
- enhancing the school environment;
- involving the family and community;
- practising organic gardening;
- developing life skills.

Here is why we think these are so important...

1. School gardens are good for children's health and education.

Good diet is essential to education. Children who do not eat well do not grow and learn well. They are often sick, miss lessons and may drop out of school early. They have less chance of getting a good job.

School gardens are not just for food, but *for better eating*. School gardens can make a direct and immediate improvement in children's diet. They can provide fruit and vegetables rich in vitamins and minerals, add nutritional value to school meals, increase the variety that is so important for health and growth, and help children to appreciate and enjoy this variety.

They can also increase the foods available in the "hungry season". Improving diet in this way can create long-term changes in practices and attitudes, and it does not rely on outside sources.

But children must not only eat better; they need to *know how to eat better*. Your school is an important setting for learning about food and nutrition. It is in close contact with families (who provide most of what children eat). If it provides school meals, it is helping to establish dietary habits. It can provide and emphasize clean water, sanitation and good hygiene and other nutrition-related health interventions such as deworming and vitamin A supplementation. School gardening completes this picture by teaching children to produce food, harvest it, store it and process it.

➔ *Will your garden put food first? Will you put the emphasis on nutrition and nutrition education?*

2. School gardens are good for learning.

Gardens are good for learning: they are a highly practical and direct form of education, where children can see the results of their decisions and actions.

Learning how to grow good food not only improves health, it can also provide a livelihood and increase self-sufficiency. Where there are many orphans, school gardens help to give children the agricultural skills and values which parents can no longer pass on to them.

Apart from practical skills in agriculture and horticulture, gardens are a living laboratory for the study of environmental issues and life sciences.





3. What is our garden for?

For children a garden is an exciting place, full of things to see, discoveries to make, and achievements to celebrate. "Educational gardening" follows the school year, is attractive to pupils and teachers and does not need much space or money. It does, however, take time!

➔ *Will your garden make learning a priority?*

3. School gardens teach business skills.



Many schools use their gardens and the children's labour to create income for the school. This is a worthwhile practical aim, and sometimes a vital one for the school and its children. But the benefit is multiplied many times if this commercial activity is also treated as an educational exercise. Some students in rural areas will make their living in agriculture. Many others will expect to supplement incomes from other occupations by growing crops for cash. Others will start small businesses unrelated to agriculture. All of them stand in need of basic business thinking, business skills and above all hands-on business experience. These can be acquired painlessly and

at little expense in the school garden, which is an excellent practical introduction to good commercial practice for older students.

➔ *Are business studies part of your curriculum? Can the garden be used for practical business skills?*

4. School gardens improve the environment.

Respect for the immediate environment begins at home – and also at school. The school grounds have elements of the natural environment, the built environment and the social environment: earth, plants and trees, insects and wildlife, sun and shade; water supply and sanitation facilities, paths and fences, buildings and shelters; places for recreation and study, social life and contacts with the outside world. Children's awareness of these, and the way they learn to treat them, will help them to grow into responsible adults. Projects to enhance the school's grounds create awareness and pride, and raise the school's reputation in the community. Even small improvements should be a part of the garden curriculum in every school year.



➔ *Is there room for improvement in your school grounds? Can it be part of the garden programme? Will you give it priority?*



5. School gardens help and are helped by the family and community.

The family and community can be involved in planning, advising, enjoying and learning from school garden projects, as well as in lending practical help, expertise, support and sponsorship. The educational value of the garden is extended to the community in the form of demonstration plots, visits, produce, children's homework, exhibitions, school open days and media coverage.

➔ *Will your garden involve and draw on families and the community? How?*



Community and school work together

In Burkina Faso a school garden project has had a real influence on the community, and vice versa. Women community workers helped schools set up gardens to grow foods rich in vitamin A. Some of these (e.g. carrots and orange sweet potato) were new to the area - they were first consumed by the children and then carried home and tried out there. Many home gardens have been started in imitation, and now people are producing and eating far more vegetables. With the increase in vitamin A consumption, there are far fewer cases of night blindness. Home gardeners are even trying out foods which have not been promoted by the community workers.

(Sifri *et al.*, 2003)

6. School gardens are good for the earth.

Organic gardening conserves the soil, protects the environment and works with nature rather than against it. It is a method of growing food that relies on the earth's natural resources, such as land, sun, air, rainfall, plants, animals and people. It uses natural methods to keep the soil fertile and healthy and to control insects, pests and diseases. It may produce results less quickly than conventional agriculture, which uses artificial fertilisers and pesticides, but in the long term it is healthier, more economical and more sustainable. Organic methods can help keep our water sources clean and free of chemicals.



Mulching

They are also safer for children because there are no dangerous chemicals. Commercially, they are increasingly profitable, as more and more people are asking for "organic" garden produce.

The organic methods we advise are:

- raised permanent beds, which need very little digging;
- crop rotation;
- natural fertilisers such as compost, green manure, animal manure;
- feeding animals on garden produce;
- using local varieties of plants and as many varieties as possible;
- conserving water by mulching, drip feeding, and using grey water;
- using natural pest control methods which avoid artificial insecticides and pesticides.

You can find out more about organic gardening in the appendix *Horticultural Notes*.

➔ Can your school adopt organic approaches? Will they fit the expectations of the community? How will you explain them to the children?

7. School gardens promote life skills: children grow with the garden.

"Life skills" are personal and social capacities such as managing work, planning and organizing, taking responsibility, working well together, understanding what one is doing, explaining it, taking pride in it and learning from experience. Including life skills in the garden curriculum means giving as much attention to "growing children" as to growing plants. It affects all activities and approaches. For example:



- If you only want to produce crops, then it is more efficient simply to tell children what to do. But if you want children to decide what to grow and



3. What is our garden for?

understand what they are doing, a lot of time will be spent on discussing, explaining, observing and making choices.

- The quickest way to make compost is to make one large heap. But if children are to learn how to do it and feel a sense of pride, it is better to have a small heap for each group.
- If you are mainly interested in production, then children's mistakes and disputes will be seen as annoying delays in the action plan. If, however, you are interested in life skills, they are opportunities for discussion, part of the learning process in social and personal development.

➔ *Will you make life skills one of your garden's main aims?*

C. MISSION STATEMENTS

Once you have an idea of the main aims of your school garden, record them in a general mission statement. This can then be discussed by representatives of the school, parents, children, the garden group, sponsors and so on. There are some examples in the box below.

MISSION STATEMENTS

OBJECTIVES OF A SCHOOL GARDEN PROJECT FOR FIVE SCHOOLS IN RURAL ECUADOR:

- Develop children's understanding of vegetable production.
- Raise children's interest in a more varied diet.
- Help children to learn to produce vegetables.
- Produce foods appreciated by the community and adapted to the local climate.
- Give opportunities for children to consume the vegetables they grow (at school breakfast).
- Encourage children to acquire attitudes of cooperation, responsibility, self-esteem and self-confidence, motivation and the value of work. (Source: Chauillac *et al.*, 1996)



OBJECTIVES OF THE URBAN NUTRITION INITIATIVE in West Philadelphia (USA)

Our school gardens emphasize nutrition education, sustainable organic agriculture, youth entrepreneurship and neighbourhood beautification. We aim to:

- Create and sustain an interdisciplinary curriculum that focuses on improving community health.
- Improve nutritional and health status by increasing fruit and vegetable consumption in low-income communities.
- Improve the urban environment through school-based gardens.
- Facilitate school-based community health promotion projects.

Foster socio-economic development through an entrepreneurial curriculum that includes business development activities (UNI, 2001).

There are natural limits to all ambitions! Get advice and discuss what is feasible. Start small and improve your garden step by step. Each year a new feature can be introduced. Your ambitions can grow with the garden.



SUGGESTIONS FOR ACTION

- Decide the school garden's priority aims – provisionally.
- Draft a mission statement for the school garden, showing main aims and interests.
- Discuss the draft mission statement with pupils, parents, the head teacher, school staff, the garden group, the pupils and interested outsiders. Then revise it and make it public.
- Find out how organic gardening methods are regarded in your area.
- Make a preliminary decision about the size and scope of the garden (Remember: Start small!).

Outputs: finalized mission statement.

TIPS AND IDEAS

- Train children to explain the "Grow with the Garden" poster at the end of Part 1 to other children, parents and visitors.
- Get children to illustrate the finalized mission statement and display it in the school.



IN THE CLASSROOM

First Things First

Many lessons can be done before garden work begins. They can open up discussions with pupils about the aims and uses of gardens, give background information about plants, soil and gardening, introduce ideas of good gardening, and help children to set up a garden record

1. Shall we have a garden? *Pupils join the debate about whether to have a school garden.*

Objectives Pupils become aware of the uses of gardens and their positive aspects, recognize their own potential role, discuss reasons for having a school garden and feel motivated to start.

Activities Pupils discuss gardens they know, posting up words and pictures of the items discussed: what they produce, what happens to the crops, what other things are found in gardens (e.g. taps, fences) and what they are for. They describe gardening jobs they know (e.g. weeding, digging) and discuss what they would like to do in a school garden, recording their ideas on the displayed words or pictures.



2. What plants like *A key lesson for all aspects of horticulture and nature study.*

Objectives Pupils become aware of plants' needs and identify the needs of particular plants.

Activities Pupils find ailing and healthy plants, describe them and note differences. They then imagine that they are plants, with *roots* (legs) and *leaves* (fingers) and answer questions:

- What do your roots like? Lots of space? Being squashed together? Being firmly fixed? Wet? Dry?
- What do your leaves like? Dark? Light? Open air? Blowing in the wind?





3. What is our garden for?

- What does your plant like? Lots of space? A lot of big weeds nearby? Good food every day? Bugs and insects (some are friends and some are enemies)?

Children speculate about why the sick plants are not well, then act out a mime or drama of young plants threatened by dangers and rescued by children.

3. Starting with soil *Children look closely at soil.*



Objectives Pupils learn to distinguish topsoil and subsoil, recognize good soil by feel and sight, and become aware of all the components of soil.

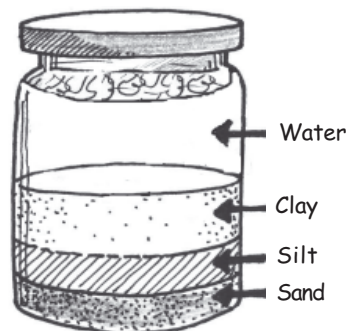
Activities In the school grounds pupils dig a hole to observe topsoil and subsoil, then inspect samples of good and poor soil, answer questions about them and learn the slogan "Good soil is damp, dark, crumbly and full of life". On sheets of paper they sort soil components into four sets: things from plants, things from animals, live things and "other", and learn to approve of organic content. They also do experiments to establish that soil contains

air (put a soil sample in water), and water (cover a sample with a plate and leave in the sun).

4. Soil quality *Simple experiments investigate soil quality and drainage.*

Objectives Pupils have a good understanding of soil structure and its importance.

Activities Students discuss which soil components contribute to: opening up the soil for air, water, roots; keeping the surface soft; providing essential food for plants; dissolving nutrients; holding soil in place; holding plants firm; allowing animals and bacteria to live; trapping water or helping it to drain. They identify the type of soil in the school garden (clay, silt, sand) by feel. Soil quality is tested by making a "mudshake" with soil and water and letting it stand for two days until the sand/silt/clay/organic matter settles out (ideal proportions are clay 4, silt 4, sand 2 and about 5 percent organic matter). They test drainage by digging a hole, filling it with water, letting it drain, filling it again and timing how fast it drains with a measuring stick (should be 6-10 cm per hour). Finally, they recognize that adding compost is the way to improve soil drainage.



(Experiments suggested by Guy *et al.*, 1996.)

5. Seeds and germination *This lesson combines science with healthy snacking.*



Objectives Pupils understand the nature of seeds and know how they germinate; they learn how to produce edible sprouts, and eat and savour them.

Activities Pupils inspect some seeds and discuss which plants they come from, then offer ideas about what seeds are (e.g. a plant egg, a food store, a sleeping plant). To make seed sprouts, they put suitable seeds (e.g. alfalfa, barley, broccoli, celery, lentils, beans, pumpkin, sunflower, wheat) to soak for a day, pour off the water, put in a glass jar, cover with a cloth and leave the jar on its side in a warm dim place in the classroom. Pupils predict what will happen.

Twice a day they rinse the seeds with cool water, observe what is happening and compare it with predictions. After the seeds have sprouted, put them in the light for a day or two until they turn green, and then eat them - with ceremony! Pupils repeat the experiment at home and explain it to families.



6. Growing plants *This lesson provides an overview of the plant life cycle in relation to food plants.*

Objectives Pupils become aware of how plants are grown and the relation to the plant's life cycle

Activities Pupils speculate on what happens after seeds have sprouted. They look at plants in different stages of development (seedling, growing plant, flowering plant, fruiting plant and seedhead), place them in order and find others in the school grounds to fit each category. They then apply these categories to crops they know well, or are planning to grow, deciding in each case if we harvest leaves, stems, roots, fruit or seeds.



A lettuce seedhead

7. Organic gardening *Organic gardening is healthier for children, for crops and for the environment.*

Objectives Pupils learn how to improve conditions for plants using natural methods.

Activities Pupils find a "sad plant", name it, and discuss how to improve its life in answer to these questions: *Has it got enough space and light? Is the earth very hard/too dry/too wet? Does it have rich soil to feed it? Is it being attacked or eaten? How can we go on helping it grow?* They take appropriate action, label the plant with date, diagnosis and remedial action, and monitor it for the following two weeks. Older children follow up by researching questions about organic approaches (e.g. *What is mulching and what is the point? Is it good to use fertiliser? What kind? What worms and insects are good for the garden?* (see *Organic gardening* in the appendix *Horticultural Notes*).



8. The garden file *Recording the life of the garden reinforces learning and heightens motivation.*

Objectives Pupils are motivated to keep records of gardening events and activities, learn how to make a documentary record and become aware of its value.

Activities The teacher shows some well-known "garden documents" (e.g. photos, map, drawings). Pupils arrange them in chronological order, suggest titles, captions and dates for each and nominate writers to label the documents. The teacher shows how to file the documents in a "Garden File" and gets individuals to insert them one by one. The students discuss what they will put in the file (Best work? Photos? Visitors' comments?) and where to keep it so it is accessible but safe. Finally they discuss what should go on the cover and front page and nominate class members to do the lettering, cover picture, etc. Volunteers undertake to explain and show the file to absent students.



NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

PART 4: WHERE DO WE START?



Raising environmental awareness

Objectives

- Mapping the grounds and the garden site
- Raising awareness of the ecosystem
- Planning improvements in the school grounds





4. Where do we start?

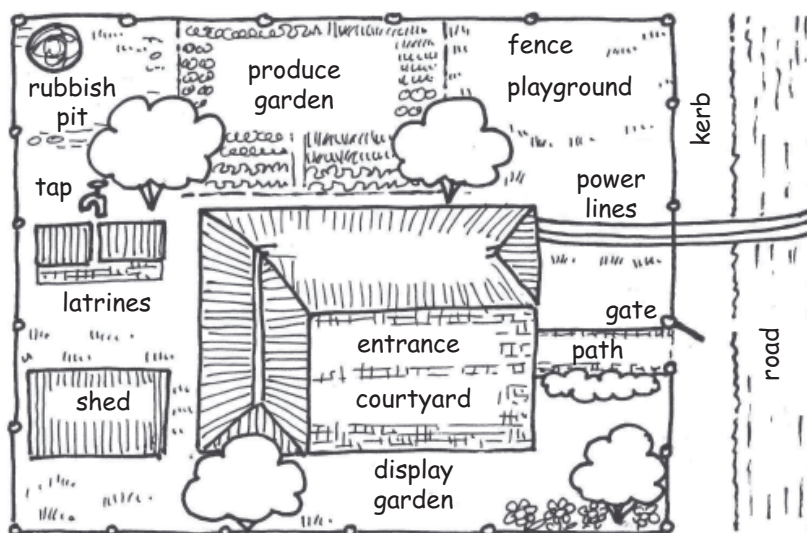
There is plenty to do before starting on the garden itself. Here are four actions for raising environmental awareness. It is best to undertake them early:

- Mapping the school grounds and the garden site encourages observation and helps with later planning.
- Launching a “greening project” enhances the school grounds and draws attention to them.
- Looking at the existing garden terrain and wildlife raises children’s awareness of the ecosystem.
- Starting a compost heap reinforces understanding of soil and recycling, and prepares the soil in good time for the coming gardening season.



A. MAKING MAPS

1. Mapping the grounds



Start by getting pupils to make sketch-maps of the whole school grounds – whatever they can manage for their age. Young children can do impressions, older pupils can make measurements and attempt realism (perhaps as part of their maths class). Make a sketch map yourself as well. A good map or picture sharpens the attention of those who make it, and will help in appeals, talks, explanations or grant applications. It can be presented to children, parents,

sponsors, the garden group, the local authorities. It gives a basis for discussion about what needs doing and how much it will cost. It also boosts morale to have “before” pictures which can be contrasted with “after” pictures at the end of the year’s work.

The map should show all the main features of the grounds – for example, school buildings and facilities, trees and bushes, flowerpots, pathways, main roads, gateways, rubbish pits or bins, water supply, power lines. Label everything: this is a good learning exercise for pupils and helps outsiders to understand the map. Have children select which maps to display, and put copies in the Garden File.

The garden site If you have a choice of positions for the garden, mark possible sites for the garden, and use the map to discuss and decide where it should go. Ideally the garden should be:

- on level ground;
- away from main traffic routes;
- visible from classrooms (and near to them if possible);
- easily seen by visitors.

Will all these be possible? If there is a choice, open up the debate on where to put the garden. Consult children, school staff, parents and expert gardeners.



2. Mapping and describing the garden site

Before starting major work, it's also a good idea to make a full description of the proposed garden site, with a photo, drawing or sketch-map (students can usually do most of these), as suggested for the grounds as a whole in Part 4. The map should show the points of the compass and be labelled with appropriate information, as below.

Two garden sites

<p>Sketch of garden site in(rural area) Size (large)</p>	<p>Notes on garden site: Goats eat plants. Fairly fertile soil, but never been cultivated: very hard. Needs plenty of organic matter. Plenty of water but has to be carried uphill.</p> <p>Main work required: Clear ground of stones - keep stones for walls. Plough soil and dig in green manure. Bring water from river (handpump and pipe?). Fence in against goats.</p>
<p>Map of garden site in(urban area) Size small</p>	<p>Notes: Clay soil needs aerating/drainage/humus. Just enough water for drinking and hand-washing - need extra for the garden.</p> <p>Main work required: Keep bushes for afternoon shade. Find alternative water supply (harvest from roof?). Cultivate and enrich soil.</p>

The map should show:

- terrain (e.g. stones, rocks, slopes, mounds, hollows, etc.);
- vegetation (e.g. trees, bushes, plants, grass, major weeds) and any other items (e.g. rubbish);
- fences, hedges, paths;
- any animals in the vicinity;
- water sources;
- other facilities (e.g. sheds).

Pupils who have done the lessons *Starting with soil* and *Soil quality* (Part 3) will be able to add notes on the soil.



B. SCHOOL GREENING

While the Garden Team is thinking about sites and amenities, it can take the lead in encouraging the school to look at the school grounds as a whole. Improving the grounds need not take a lot of effort, and it can generate environmental awareness, improve amenities, raise morale, involve the community and bring the school some good publicity. A positive approach to the whole school environment also creates a favourable atmosphere for developing the school garden itself.

Green Belt school

Gangadhar Bidyaniketan is a secondary school surrounded by paddy fields in eastern India. During the rainy season ... students and teachers had to walk two kilometres in mud and water to reach the school. In the summer there was no water at all and children had to carry water bottles to school. There was not a single tree in the area. The school decided to make changes. Each student agreed to plant and care for one tree. Choosing the locations carefully, they created a green belt around the school. With the help of a local NGO the villagers built an approach road and a water tank on the school campus. The school now has plenty of drinking water and can use the surplus water for growing vegetables and flowers.... The land that was barren and saline is now green and colourful.

(Pattanaik, 1998)

Suggest to the school and the parent-teacher association that they think about priority projects for the school environment. The questions below can be discussed with pupils, school staff and parents, using the map of the school grounds for reference, and followed up with the lesson *Ideas for the school grounds* (see the end of this chapter).

- Does the school environment look good? How could it improve (trees, entrance, flowers, bushes, hedges, grass, divided areas, outdoor art, clearing or hiding rubbish)?
- Does it have all the necessary facilities for health and healthy eating (e.g. toilets, washbasins, rubbish pits, cooking facilities, drinking water, tables to eat at, proper paths, seats, rain shelters, a stand/stall for serving or selling garden produce)?
- Is it a good place to play, relax, talk and study? What does it need (seats, shade, eating areas, study areas, a courtyard, swings,

a performance area, trees to climb, a play house, a ball wall, a tree house, a courtyard for meetings or performances)?

- Does it have room for wildlife (e.g. a wildlife habitat, a pond, a bird house/bird table, a woodlot)?
- Which of these needs are high priority? Which can be tackled by pupils?

Some possible "greening" projects are:

- creating play areas, study areas, leisure areas, "outdoor rooms";
- planting shade trees;
- planting hedges;
- planting grass or ground cover;
- making seats and tables for eating, potting plants, writing garden records;





- creating an outdoor cooking oven;
- planting and maintaining ornamental plants, aromatic shrubs, evergreen bushes;
- creating scrap sculptures;
- making special gardens (e.g. herb gardens, a dryland garden);
- growing plants that have many purposes – e.g. improving the soil, giving food, medicine and wood for fuel or construction;
- making weatherproof signs for all garden projects.

Greening the grounds



Prickly pears make good living fences.

Their roots bind the soil, they produce delicious edible fruit and they look attractive.



Neem trees look good, give shade all the year round and provide a natural insecticide.

What more could you want?



Note: Start the school thinking about improving its environment. But leave ambitious projects for the school grounds to others. A garden is quite enough to be getting on with!

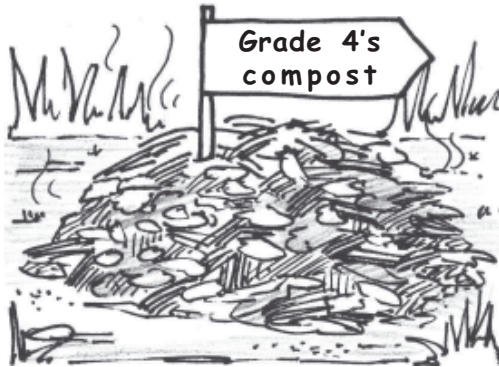
C. TAKING THE ECO-VIEW

Before starting major works in the garden itself, remember that your activities are going to interrupt an existing pattern of life. Nature's garden is already established and working. Before you change this existing world by creating your own garden, get children to look closely at it (see lesson outlines *Ecological audit*, *Garden citizens*, *Insects and others* at the end of this chapter).

This will introduce pupils to the idea of ecosystems and interdependent systems of living things, and will help them to understand organic approaches to gardening. They will learn the valuable habit of making observations of insects, plants and earth, which can build up later into regular garden patrols. The results of these inspections can be added to the Garden File.



D. STARTING COMPOST HEAPS



If you plan to use compost in your gardening, you will need to prepare your first compost heaps early (see *Compost* in *Horticultural Notes* and the two outline lessons on compost at the end of this chapter). Preparing compost reinforces children's understanding of soil and the natural cycle of vegetation, introduces the idea of waste recycling and can begin to involve parents and families in making contributions to the garden. Decisions to make are whether you will have one big heap or several small ones, where you will put them, what you will use for compost and whether families can help.

SUGGESTIONS FOR ACTION

- Make and display a map of the school grounds.
- Open a debate on where the garden should go (if there is a choice).
- Map the garden site.
- Suggest that the school discuss priority needs and wants for the school grounds with school staff, the Garden Group, children and parents.
- Before establishing the garden, encourage children to study the existing ecosystem.
- Work with pupils to start compost heaps.

Outputs: Maps of school grounds and garden site
Compost heaps

TIPS AND IDEAS

- Make a display of students' maps, drawings and photographs of the grounds.
- Make a "mud map" of the grounds, in the grounds, and let it dry out in the shade.
- For inspiration, send for beautiful seed catalogues from seed companies. Visit local gardens with students.
- Appeal for contributions (material and labour) to the compost heap and organize children to bring material from home on a particular day of the week.
- Get groups to "adopt" their own compost heaps and make signposts or flags for them.





IN THE CLASSROOM

ENTRY POINTS These lessons aim to raise children's environmental awareness. They look closely at the existing ecosystem and the role of insects, introduce children to composting and the idea of waste recycling and raise ideas for improving the school grounds.

1. Ecological audit *Looking at nature's garden.*

Objectives Pupils become aware of the existing ecosystem, its diversity and interdependence and recognize that it is a habitat for many forms of life.

Activities In the classroom, students imagine approaching the garden site from different points of view: (1) *Flying*. They are flying slowly over the site – what do they see? What kind of terrain? (2) *Landing*. They land near a particular plant. What is it? What does it live on? What lives on it? What does it produce? Does it give shelter? (3) *Creeping*. They "shrink" to beetle size. What is around them? What is going on? What lives here? What passes by? What food is there? (4) *Burrowing*. They burrow into the soil like worms. How does it feel? Who lives here? Who eats what?



Pupils then go into the garden, repeat the exercise, and report their observations.

(Adapted from Kiefer & Kemple, 1998)

2. Garden citizens *Agriculture depends on insects.*



Objectives Pupils recognize that most garden life is friendly, and start the habit of observing insects and other garden creatures.

Activities Pupils find and observe garden creatures and in class describe what they have seen. The teacher adds live examples or pictures of common "garden citizens". Pupils say how they feel about each, and why. Class groups take on the roles of insects, other animals, plants and soil, and say how they link to other groups (e.g. *We're birds; we eat insects*). The insects then "die" and the class discusses what would happen if there were no in-

sects (e.g. hungry birds, no fruit, poor soil). Discuss how to have friendly insects in the garden (e.g. by growing flowering plants, including a weed patch, and not using insecticides). Follow with a Bug Hunt or study a clutch of insect eggs hatching on leaves in the classroom.

3. Insects and others *Less than 1 percent of insects are dangerous to crops and many are beneficial.*

Objectives Pupils identify particularly beneficial insects and common harmful pests.

Activities Using real specimens or pictures, pupils identify the most common garden creatures, say what they know about them and speculate which are helpful, harmless or harmful. The teacher presents two "garden enemies" (e.g. slugs, aphids) and discusses what they do (chew or suck leaves or roots) and how we can see this (holes in leaves, plants wilting); then two "garden friends" (e.g. earthworms, ladybugs) which fertilize flowers, catch pests, turn garden waste into nutrients and open up the soil. Follow with a garden walkabout to spot garden friends and enemies or the signs of them; make a "Garden friends" poster or a Bug Book based on observations.



Examples of "garden friends"

(See *Beneficial garden creatures*, *Pests*, in the appendix *Horticultural Notes*).



4. Where do we start?

4. Compost *Do this lesson in the garden before starting the compost heap.*

Objectives Pupils learn to recognize compost and appreciate its value.

Activities The teacher introduces compost as plants' favourite food and distributes handfuls to small groups. Pupils look, smell, feel, squeeze and say what they observe (brown, crumbly, damp, earthy, light). The teacher demonstrates planting a "happy plant", showing how compost is added at various stages for various reasons. At the end, pupils chorus the answers to questions:

- *Is this a happy plant? (Yes!) What makes it grow? (COMPOST!)*
- *What keeps the soil airy? (COMPOST!)*
- *What gives it food? (COMPOST!)*
- *What keeps it damp? (COMPOST!).*

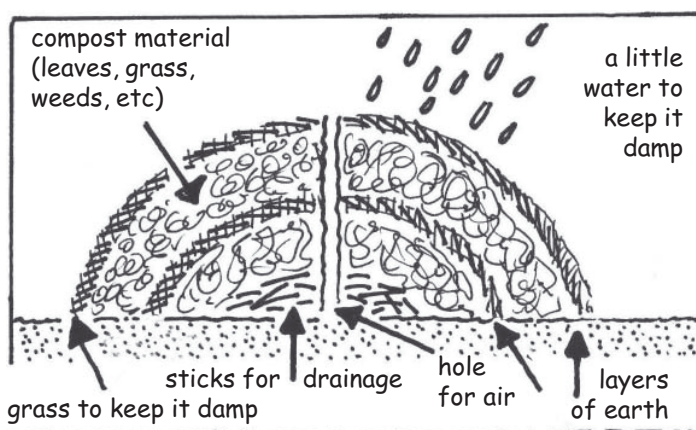
The teacher reads out a list of compost ingredients and pupils undertake to bring some from home for the compost heap.

(see *Compost* in *Horticultural Notes* appendix.)

5. Cooking compost *This lesson prepares for compost making.*

Objectives Pupils appreciate the value of compost, know how to make it and start to use it.

Activities Pupils recall the virtues of compost (gives nutrients; makes soil roomy and airy for roots to breathe and bacteria to work; holds water but also lets it run through; is natural and cheap). The teacher says making compost is like cooking: you need food, heat, air, water and a pot. S/he demonstrates by making a little compost in a bucket, talking through the process by asking questions about what to do next and why (see *Making compost* in *Horticultural Notes*). The class monitors the experimental compost, which will be ready in about two weeks. Fix a date for making the real compost heap, and ask pupils to bring contributions.



6. Ideas for the school grounds *A practical lesson in environmental awareness.*

Objectives Pupils make practical proposals for improving the school grounds and initiate action.

Activities The teacher presents several ideas to the class (see Section D above), with pictures or sketches if possible. Older students add their own ideas. The class goes into the grounds to size up the possibilities (older students work in groups, one for each idea, and report back). For each idea pupils consider relevant questions, e.g. *Where will it be? How big? What will it be made of?* The class makes the final decision and suggests the first practical steps to take and who is to take them.

PART 5: WHAT DOES OUR GARDEN NEED?



The garden site

Objectives

- Preparing the site
- Preparing and improving the soil
- Identifying needs
- Planning and laying out the garden





5. What does our garden need?

If you do not already have a garden, preparing the site may be the most expensive part of your project. Once you have identified and mapped your location, decide what needs doing, estimate the equipment and supplies needed, discuss how to plan and lay out the garden and organize the site preparation. This is the time when you will really appreciate voluntary help!

A. IMPROVING THE SITE

1. What have we got and what do we need?

Walk around the garden site with your colleagues. Take a map of the site with you to aid discussion and record observations. Start making a list of *what you've got* and *what you need*. Also find out about local practices and local resources and consult the *Horticultural Notes* where appropriate. Here are some points to consider:



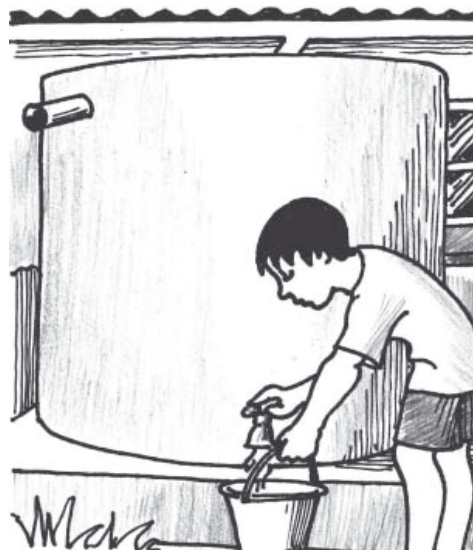
Photo FAO/INCAP, 2005

Protection against predators This is critical. A bumper crop is no use if it is eaten by the neighbour's goats. What are the natural predators in your area? Chickens? Pigs? Wild animals? How do local people enclose gardens or protect a particular crop? Are there already good fences, hedges or walls to protect the garden? (See *Protecting the garden* in *Horticultural Notes*.) If not, can you create effective barriers? What will they cost in time and/or money? Will they need maintenance? Will the size of your garden be limited by the amount you can enclose? Will you need a night watchman to prevent theft?

Water supply Water supply is also extremely important. Vegetables in particular take a lot of water. A good water supply leaves you free to decide when to plant and when to harvest. It must be reliable, clean, cheap and accessible. Where does your water come from? Can you rely on it? Is it available in the dry season? Will you need to budget for renewing pipes, pumps, cisterns or tanks? Who is responsible for maintenance of such equipment?

- If water is scarce or expensive, can you improve the supply? For example, can you harvest rain-water from roofs? Can you conserve water by using "grey water" from washing dishes and clothes? What kind of garden beds will be best? What crops flourish in dry conditions? What watering system will you use? How will you keep water in the soil?
- If there is a risk of flooding or waterlogging, what kind of drainage will you need? What kind of beds will you make? What crops love water? How will you protect plants from heavy rains?

For all these questions, check the advice on *Water management* in the *Horticultural Notes*, find out the strategies adopted in your area and consult local agricultural experts.



Protection from the sun Plants need plenty of sunlight (at least eight hours a day). But in hot climates, some shade in the mid-afternoon is a help. Where will you put delicate plants? What can you use for shade (trees, walls, hedges tall plants, screens)?



Terrain Level ground is most convenient. Steep slopes need terracing, which is a big job.

- If the land has already been cultivated, what crops were grown? You should not plant the same crop again soon (see *Crop rotation* in *Horticultural Notes*).
- If it is virgin land, do you need to remove rubbish, roots, rocks, tough grasses?

What is there on the site that you can use? For example:

- Perennial flowers and bushes have already shown they can survive. Use them for hedges, for fruit, for nature study, for attracting beneficial insects, or just for visual interest.
- Established trees give shade for people, plants and compost; fallen leaves for compost or mulch; shelter from the rain and anchors for the soil.
- If trees must be cut down, use the logs for seats or benches, or for boxing garden beds.
- Natural ditches can be turned into ponds or irrigation channels.
- A small mound can become a meeting point, a display area or a natural stage.
- Existing paths are there for a reason. Keep them in place and plan the garden around them.
- Stones and pebbles can be used for making walls, marking out or decorating garden beds and paths, making weather-resistant signs, lining drainage ditches, making natural seats.
- Some rubbish has uses – for example, old car tyres make good container gardens, swings and even walls; plastic bottles can become watering cans and buckets; bits of bark, branch and plastic can be used for garden signs.



Soil and drainage What kind of soil do you have? Get a soil analysis done by the local agricultural service. Get older students to repeat the analysis and see if they come to the same conclusions. The analysis will tell you about acidity, composition and chemicals.

- **Acidity** If the soil is too acid, you will need to add lime; if it's not acid enough, add sawdust, composted leaves, wood chips or peat moss.
- **Composition** (the proportions of sand, clay, silt and organic matter). Generally you will need to add more organic matter to help with drainage.
- **Chemicals** If there is a lack of nitrogen, potassium or phosphate, these can be restored with natural fertilisers (see *Nutrients and fertilisers* in *Horticultural Notes*).

Storage facilities You will need secure storage facilities somewhere to keep tools and equipment. A lock-up shed is ideal. Or can you use a storeroom in the school?



5. What does our garden need?

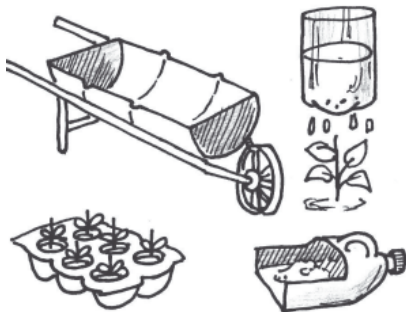
2. What do we need to do?

After this survey, you will have an idea of what needs special attention. Here are some of the actions you may need to take:

Site improvement <ul style="list-style-type: none"> - decide what to keep - remove rocks/roots/bushes - kill perennial grasses and weeds - level the ground - establish fences/hedges/walls - dig drainage ditches - provide a secure garden shed 	Water supply, water policy & irrigation system <ul style="list-style-type: none"> - improve and secure water supply - develop water management policy - establish watering/irrigation system Soil improvement <ul style="list-style-type: none"> - do a soil analysis - add lime/natural fertilisers - dig over the soil - dig in compost/manure/green manure - start compost heap(s)
---	--

If there are major works to be done, list them, prioritize them and estimate the cost in money and labour. Think how parents and the community can help. Also establish clearly any legal aspects related to investment in fencing, irrigation, drainage (e.g. repayments on loans, property and user rights, maintenance obligations).

B. BASIC EQUIPMENT AND SUPPLIES

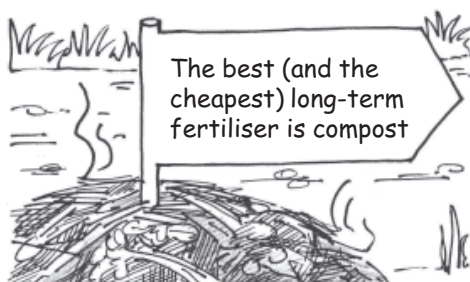


What equipment and supplies have you got, what do you need and how can you get them?

Equipment To decide how much equipment you need, estimate how many people will be working in the garden at any one time. Children may also be able to borrow tools from home. Indeed, some schools manage without any tools or equipment of their own at all. Some tools and equipment can also be homemade – if so, make sure they are light enough for small children.

The list below shows the desirable basics for about 30 users. Use it to identify your immediate needs and to discuss equipment with students, families and your garden advisers.

- 2 wheelbarrows
- 6 hoes
- 2 spades
- 2 pangas/machetes
- 3 watering cans
- 1 hose
- 1 water barrel
- 10 multi-compartment re-usable plastic seed trays
- 2 rakes
- 2 trowels
- 2 buckets
- 2 baskets
- 2 hand shovels
- 2 pruning shears
- 1 knapsack sprayer
- stakes, sticks, string



Supplies Other supplies are seeds, saplings, cuttings, organic fertiliser. Some seeds can be saved from good healthy plants. Some plants (e.g. sweet potatoes and water spinach) can be propagated with cuttings: this makes for interesting lessons as well as cutting costs. Otherwise we recommend commercially produced seeds. The Ministry of Agriculture may help with supplies, or you may persuade seed producers, garden centres or traders to make donations.



C. PLANNING AND LAYING OUT THE GARDEN

Planning and laying out the garden is one of the most enjoyable tasks. Children should be fully involved in the process (see the lesson outline **Garden layout** at the end of the chapter).

1. Garden beds and other essentials.

The main elements of your garden are beds, paths, plant nurseries, compost heaps and a garden shed if possible.

Garden beds What type of garden bed do you want? For most situations we strongly recommend “permanent raised beds”. To make these you dig over the soil and add compost, then remove the topsoil from the paths and heap it up on the beds (see *Garden beds* in *Horticultural Notes*). The rule with permanent raised beds is: NEVER walk or kneel on them and compact the soil. If the soil is left alone it keeps its structure, does its work better, and (best of all) needs very little cultivation. Raised beds require quite a lot of work at the beginning, but much less later on. They are easy to maintain, easy to work with, highly productive and excellent for improving the soil.



- **Where?** Try to give all parts of the garden easy access to water. If there is a slope, make beds *across it* to catch water and prevent erosion. If possible, put class plots near to the classroom window. This helps to keep an eye on crops, livens up lessons and scares away predators.
- **How big?** Children must be able to reach every part of the bed easily without standing on the soil. About 0.6 m wide is good for small children, 1 m for bigger ones. The length depends on how much land you have, how many plots you want and how much you plan to grow. 1m is a good length for small children, 1.5 m (the “doorsize garden”) is big enough for most learning purposes, while 10m is a standard length for commercial production.
- **What shape?** Rectangular beds are the easiest to manage, but there is nothing wrong with crescents, circles, triangles, letters of the alphabet, or any other shape, provided children can reach the plants without standing on the bed. You may want to use conventional rectangular beds for the main production and have a few odd shapes for fun or for decoration. Consult the children.
- **How many?** The number of beds depends on how you organize the work (see Part 10). Have at least one bed for each class. Motivationally it is even better to have one bed for each small group, with some small individual plots for experiments, demonstrations or rewards.

Paths/walkways Plan to have paths all round the beds, 1m wide, to allow for wheelbarrows and children passing – there is a lot of traffic when a whole class is working. Let other paths find their own way. If there is a lot of traffic, earth or grass paths will maintain themselves.

Plant nursery Seed beds need shade and protection (see Part 8). One way to protect seedlings is to grow them on a table. They can be shaded with a frame roofed with fronds. A table is also useful for re-potting plants, drying seeds, writing out labels, etc.





5. What does our garden need?

Compost heaps Locate compost heaps in several places fairly near to the beds (under trees is convenient), and leave some space for storing mulch. Special compost bins or containers are useful but not essential (see *Compost* in *Horticultural Notes*).

In some Uganda rural schools they use the existing rubbish pits for compost, adding a little soil. Children bring dung from cows, chickens and wild animals to add to compost.

(C. Ssekya, personal communication, 2003)

2. Optional extras

While planning, discuss what other features you might want some day in the garden.

For example:

For gardening:

- a demonstration or experimental plot
- a crop drying or processing area
- a scarecrow or other kind of bird scarer
- a woodlot of dense bush or trees²

For social life, study and play:

- a central courtyard for meetings or performances, with places for spectators to sit
- tables, benches, logs, rocks for sitting, eating, reading and writing garden journals
- a ball wall
- a grassy communal area for sitting, playing, having outdoor lessons or meetings
- swings, seesaws and other games

For cooking:

- a cooking area and outdoor oven

For sales:

- a stand or stall for serving/selling garden produce

For information:

- a weatherproof bulletin board
- a weather station (thermometer, barometer, etc.)
- a map or plan of the garden on display
- labels and signposts

For decoration

- some outdoor art
- an entrance arch
- ornamental bushes and flowers

For environmental studies:

- a wildlife habitat
- a bird house or bird table
- a pond

3. Special garden designs

Special garden layouts often don't require additional work. They can be decorative and stimulating, may carry symbolic messages and give practice in mathematics and measuring. Here are some special garden designs you might like to try:

- **The Three-A-Day patch** consists of a papaya tree with cabbages and carrots around it. It encourages children to eat three fruit or vegetables every day.
- **The Vitamin A** garden has pumpkin, carrots, sweet potatoes, dark green leafy vegetables, and a papaya tree. It aims to make children aware of fruit and vegetables rich in vitamin A. (Adapted from Kiefer and Kemple, 1998)
- **The Square-Foot Garden**, for where space is limited, is just 1m square and is divided into nine squares, each with a different mini-crop. (Guy *et al.*, 1996)



Foods from the Vitamin A garden

² A small wood can provide wind protection, shade, firewood, fodder, fronds, branches and stakes, mulch, baskets, even medicines (versatile trees are bamboo, banana, neem, acacia, willow).



- **The Dryland Garden** consists of sunken beds to keep water in, protected with windbreaks or fences of sticks and planted with plants which are drought-resistant – e.g. green and black gram beans, roselle, amaranth, okra, mango, grapes, jujube.

4. Signs and labels

Making signs and labels for the garden should be part of students' garden work every year. They may give names, directions, information about plants, food values, sponsors and so on. They revise learning, exercise literacy, and keep everyone in the garden informed. Give the task of sign writing to class artists, deserving pupils or group leaders as a special responsibility. At the end of the season most of the signs should be removed, to be renewed in the next gardening season.



Photo courtesy of C. Power, Sligoville school, Jamaica

Garden signs should be fairly durable, but do not need to last more than a season. Use unwanted rubbish that will stand the weather – wood, horn, bone, stones/rocks/pebbles, string, rope, cane, old car tyres, bits of plastic sheet, aluminium strip, sticks and twigs, gourds and calabashes, plastic bags. You will also need a hammer and nails, some good strong glue, oil paint, paraffin and a small paintbrush (or pieces of fibrous wood). A small blowtorch is useful for burning letters into wood, bone or gourds – or you can use a hot poker.

For special occasions students can put up temporary labels with information about food value, history, projects, class involvement, etc. Use brightly coloured paper and pens.

For special occasions students can put up temporary labels with information about food value, history, projects, class involvement, etc. Use brightly coloured paper and pens.

D. STUDENT INVOLVEMENT

School students may not be able to do all the work needed to establish a garden, but they should be involved as much as possible. They can participate by:

- mapping and studying the site;
- discussing and researching supplies and equipment needed;
- observing and recording garden works;
- guiding visitors round the site and keeping families informed;
- studying garden layout and garden beds;
- labelling and signposting the garden.



All these make interesting lessons. While the site is being prepared, it is also a good time to have lessons on soil and water, tools and equipment and to chart the progress of the compost heaps.



5. What does our garden need?



SUGGESTIONS FOR ACTION

- Get students to sketch, photograph and describe the garden site.
- List what needs doing and estimate costs.
- Make an inventory of existing equipment, and another list of equipment needed, with costs. Get students to help in finding out prices of equipment needed.
- Find out the legal situation regarding ownership and maintenance of garden equipment.
- Consult the Garden Group about who can help with the necessary work and equipment.
- Brief older students on what the site needs. Prepare them to conduct sponsors, volunteers, parents, the garden group, and other children around the site, either one by one or as a group.
- Consult local gardeners about garden layout, then discuss and decide what is feasible in the school with staff, students and families. Plan the garden layout with the students.
- Display the planned layout in the school, and put a copy in the Garden File.

Outputs: Pictures and description of existing garden site
List of main works required, with estimated costs
List of essential equipment and supplies, with estimated costs
Garden layout plan
A team of student guides

TIPS AND IDEAS

- Prepare a one-page appeal for help using students' best pictures, the garden logo, and the mission statement. Underneath write *WE NEED....*, list the needs, and finish with *CAN YOU HELP?* Display the appeal in the school and get students to make copies. Use it in class for reading comprehension, and ask children to take it home and tell their parents about it.
- Have a fund-raising event for the garden. Make each class responsible for one item (e.g. hoes, wheelbarrow). Draw it poster-size, put the price on it, and colour in the parts as the money comes in. Students keep records in their Garden File.
- Let pupil groups choose which plots they would like to cultivate. Give the plots names.
- Set up a "fund thermometer". Mark donors' names on it prominently.
- To get a lot of work done, have a Garden Party. Invite helpers and ask them to bring some food to share. Start in the afternoon, work for two hours, then sit down to eat together.



Get pupils to label and signpost all features of the garden as they are established. Then have them organize a quiz for other students about the garden.



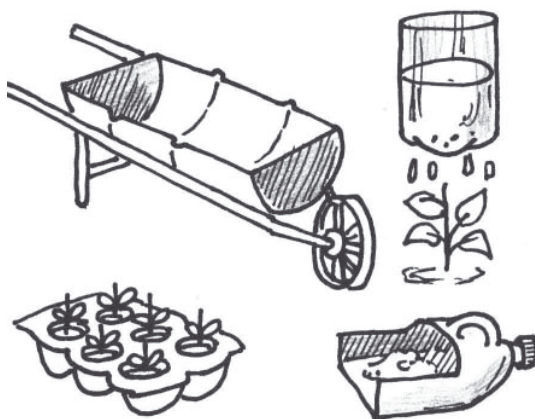
IN THE CLASSROOM

PREPARING THE GROUND Children should be involved in choosing, planning and preparing the site, even if they do not do the heavy work themselves. These lessons encourage them to evaluate garden resources, understand site preparation activities, plan garden layout and start creating garden beds.

1. Tools and equipment *Children need good routines for using and storing equipment.*

Objectives Pupils recognize common gardening tools and how to use them, care for tools properly, can tell others what to do, and decide how to implement garden rules. Older pupils can help with purchasing by researching the market and identifying good quality tools and best buys.

Activities Pupils handle garden tools, say what they are for and demonstrate how to use them if they can. For each tool, the teacher calls for ideas on (a) how to leave it so it won't be dangerous (e.g. hoes with "head in air"), (b) how to prevent it from getting rusty (e.g. buckets upside down, trowels in bucket of sand), (c) what to do after using it (clean it and put it back). The class discusses a code of conduct for equipment – e.g. *Put it back in the right place! Stand rakes up!* and decides if they can remember the rules or need to write them up. Volunteers undertake to brief those who are absent.



2. Water management *For areas where water is a problem*

Objectives Pupils know the sources of gardening water, appreciate the need to conserve water and have some ideas how to do it.

Activities Pupils respond to the following questions:



- Where does our school garden water come from? How does it get to the school?
- Could we get water from anywhere else (e.g. rainwater harvesting, making ponds, using "grey water" from washing and cooking)?
- How can we use less water (e.g. mulching, composting, drip irrigation)?
- How will we get the water to the plants (e.g. hose, watering can, bucket)?

Older pupils explain and elaborate their suggestions. Pupils follow up by making a map of the water supply or irrigation system, or taking (and then giving) a guided tour of the school water system.

3. Preparing the site *Involve children in site preparation planning and activities.*

Objectives Pupils have a clear picture of the garden site, recognize what needs doing and are able to interpret site preparation activities.

Activities Pupils walk round the garden site observing and describing the *main features*, *existing plants*, *contours* (slopes and bumps) and *facilities* (e.g. tap, shed). They discuss what to do with rubbish; trees, bushes, grass and weeds; bumps, hollows and slopes; rocks and stones. They decide if there is a need for fences, what the soil needs, what to do about water supply and where the garden beds should be. Older students make a map of the garden incorporating proposals and



5. What does our garden need?

prepare to present ideas to other classes or visitors. To follow up, pupils explain what needs doing to their families, and record site preparation activities in drawing or writing.



4. Protecting the garden *The battle against animal predators is an exciting area of action.*

Objectives Pupils recognize the main predators and know how to protect the garden against them.

Activities The teacher tells a story about child gardeners and how they frustrated predators, or draws/ shows a predator and a plant and asks pupils to explain the danger and how to prevent it. The class collect more examples of local predators from families and local farmers (see *Protecting the Garden* in *Horti-*

cultural Notes) and record what they eat, what they do (e.g. climb, burrow, fly, scratch) and how to stop them. They find signs or threats of predators in the garden and implement practical measures against them such as hedges, walls and fences. Use their findings to build a classroom dramatization of the battle for the crops, or make a poster.

5. Garden layout *Children should be involved in planning beds and paths in a new garden.*

Objectives Pupils recognize essential elements of garden layout, and contribute to layout planning.

Activities The class discusses what is needed in their new garden (e.g. plots, paths, signposts, flowers, shed, taps). They inspect the garden, discuss and decide:

- how many beds are needed (one for each class/group?);
- where they should be (near classrooms, *across* slopes);
- how big they should be (wide enough to reach the centre without standing on the bed – pupils try this out for themselves);
- where the paths should go (all round the beds, along existing paths?);
- how wide they should be (enough for a wheelbarrow or for carrying buckets – pupils try this out for themselves).

Older students mark out the site with pegs and string and make a scale plan. Older students may like to sketch the proposed layout on a garden map (see Part 4).



6. Garden beds *Permanent raised beds are productive, convenient and good for the soil.*

Objectives Pupils understand how beds provide what plants need, learn not to walk on raised beds, can describe the kind of beds adopted by the school and know how to make them.

Activities Pupils recall what plants like - no competition, good soil (rich, damp, airy, firm, full of life) and recall what they know about topsoil and subsoil. Using a prepared slice of soil, the teacher demonstrates in miniature how to make raised beds. S/he divides the "bed" from the "path", digs over the bed, adds compost, waters it and lifts the topsoil from the path onto the bed. Pupils discuss how these beds will be full of air and life and should not be disturbed by walking or kneeling. To follow up, pupils help to prepare garden beds, and explain their advantages to visitors.

PART 6: WHAT SHALL WE GROW TO EAT?



Improving nutrition

Objectives

Deciding what to plant by:

- identifying nutritional and dietary needs
- finding out the nutritional value of local foods
- choosing foods to grow which will improve the diet





6. What shall we grow to eat?



Here we concentrate on growing food to eat. Deciding what to grow is the subject of this part. Deciding what to do with it after harvesting is dealt with in Part 9. Before coming to a final decision about what to grow, consult Part 9 as well.

The “practical purpose” of growing food is to improve children’s diet. Its educational aims are to show how this can be done and to raise awareness of nutrition issues.

The school garden cannot usually provide a large part of children’s diet. One reason is that the children are not at school all year. Another is that they do not have time to grow a great deal in the garden. But the garden can have a strong *influence* on what children eat:

- **It can increase the variety in the diet**, adding essential vitamins and minerals in fruit and vegetables, and extra protein (for example, from beans or eggs). Small amounts of poultry or meat are important for adding minerals like iron and zinc that are essential for child growth and intellectual development.
- **It can create a taste for a variety of nutritious foods** so that children and their families will plant and cook more varied and nutritious foods themselves.
- **It can extend and balance school meals.** Many schools only receive dry staple foods for school meals or take-home rations. Fresh fruit and vegetables from the garden can make all the difference to creating well-balanced and varied meals.
- **It can provide snacks to keep children going.** Breakfast and mid-morning snacks and drinks are especially valuable since they give children energy for the whole morning. Children can learn how to make their own snacks from garden food or food produced at home.
- **It can build awareness** in children and their families of what makes a healthy diet.
- **It can promote crops** that are neglected and undervalued, or that can be stored/preserved for the hungry season.

All these influences are most effective when school gardens are taken as a model and imitated by children and families in the home garden. In this way the school garden shows what can be done, and its influence is multiplied.

Schools talk about gardens and food



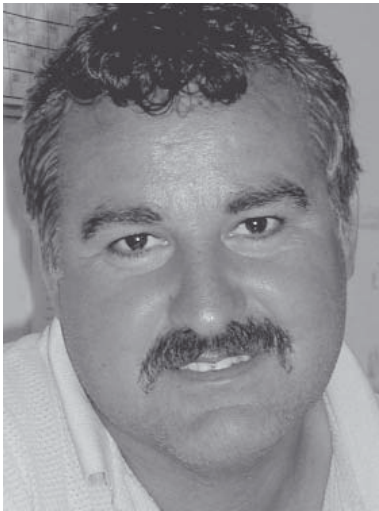
Photo: © Microsoft Clipart

We have created a 'snack food garden' with the help of a local farmer. Children grow and can beans, pickle cucumber, make carrot cake and carrot soup, roast pumpkin and pumpkin seeds, and eat fresh green pepper, tomatoes and new peas raw. They eat some of the food themselves and sell some at break time to other children. The snacks give a lot of vegetable protein and vitamin A, and raise children's appetites for fresh garden food.

(<http://www.kidsgardening.com>)



Our herb garden is famous: it has been publicised on radio and TV. It supplies all the flavourings in the school meals. We also encourage children to find wild herbs and bring them to school, and to find out traditional recipes which use them.



Our school kitchen buys all the food the garden produces. We consult with the cooks about what to grow. But we need more coordination. Sometimes the cooks don't know how to cook what the garden produces, and sometimes the children won't eat it when they've cooked it.

The school kitchen uses about half the garden produce. On Fridays, when there is no school meal, children have lessons on meal planning, and prepare and cook garden food in the school kitchen. Each class cooks its own produce. Half the class keeps the records, the other half does the cooking, and they all clean up. At Christmas we usually eat one of our goats, the whole school together.



There are two women community workers who work with our school to grow food to increase the vitamin A and iron in the children's diet, especially in the dry season. We produce carrots, orange sweet potato, local squash, okra and dark green leafy vegetables, and we are experimenting with fruit trees - mango, papaya, néré, morengo and guava, which are rich in vitamin C. The garden produce is used in the children's lunches.



6. What shall we grow to eat?

You may already have a good idea of what food to grow. If not, get information and advice from parents, children, nutritionists and health workers, horticulturists, local gardeners, home economics teachers, and consult the school meals programme. Discuss these questions with them:

- Do the children suffer from malnutrition?
- Are they often sick, tired and unable to concentrate in class?
- What are they actually eating?
- What kind of diet do they need?
- What can we grow to improve their diet?
- How will they eat it (and *will* they eat it)?

A. MALNUTRITION: IS THERE A PROBLEM?

Many children in poor countries and communities have inadequate and unbalanced diets, which result in malnutrition. Children's growth and behaviour are good indicators of their overall health. If they are small for their age, tired, unable to concentrate and frequently sick, they may be malnourished. The three main kinds of malnutrition are:

- **Undernutrition** When children are not getting enough of the right mix of foods, they are tired, fall ill easily and do not grow well. They may also have problems learning at school.
- **Overnutrition** If children eat too much, do not get the right mix of foods, and do not have enough exercise, they can become overweight. This may lead to adult overweight or obesity and many health problems.
- **Micronutrient malnutrition** Many children do not get enough of some essential vitamins and minerals. These "micronutrients" carry out vital tasks which make the body work well. They give good sight and skin, protect the body against disease, help to release the energy in food, allow the brain and body to develop properly, and so on. It is estimated, for example, that a million children die each year because they do not have enough vitamin A. Most vitamins and minerals are available in foods which can easily be produced in home or school gardens. Often people simply do not realize that these foods are essential for health.



For more information about the problems, effects and symptoms, see the Nutrition Factsheets *Hunger and malnutrition* and *Energy and nutrient needs*.

➔ *Are these serious problems in your area? Is there undernutrition or micronutrient malnutrition? Consult health services, local nurses or community workers.*

B. WHAT KIND OF DIET DO CHILDREN NEED?

A diet is not only what you eat, but also how you eat it, how many different things you eat, how often and when.

1. What foods should our children be eating?

To grow into healthy intelligent adults, children need to be eating all these foods regularly:



Cereals (e.g. maize, millet, sorghum, rice, wheat) provide a lot of energy, protein and (if eaten as whole grains) substantial amounts of vitamins B and E. To get their full food value they should be eaten with many other foods.



	<p>Roots and tubers (e.g. cassava, taro, yam, sweet potato, potato) are also very good sources of energy and some vitamins, but have less protein than cereals. They should be eaten with many other foods.</p>
	<p>Legumes (e.g. cowpeas, chickpeas, beans, soybeans) are a rich source of protein. Some also have fat, vitamin E, calcium, iron and zinc, which children need to grow and to develop their brains.</p>
	<p>Oilseeds, nuts, fats, oils are the most concentrated sources of energy. Even in small quantities they can make a big difference to the diet of physically active children. Those from plants (e.g. groundnuts, sunflower seeds, soybeans, sesame, olive, rapeseed) are the most healthful. Some also provide protein and vitamin E. Red palm oil is very rich in vitamin A. Groundnuts are an excellent snack for children but should not be very salty.</p>
	<p>Vegetables and fruits are rich in many different vitamins and minerals and other substances which protect our health, especially dark green leafy vegetables and yellow or orange fruits and vegetables (e.g. pumpkin, yellow/orange sweet potatoes, papaya, mango, carrots). Dark green leafy vegetables release all their nutritional value when combined with other foods. Children should eat five different types and colours of vegetables and fruits every day (dark green, yellow/orange, red, citrus and legumes).</p>
	<p>Animal foods are rich in high-quality protein and minerals, such as iron and zinc. Milk and cheese provide calcium for strong bones, while chicken eggs provide vitamins A and D as well as protein. Small fish, if eaten whole with the liver, are rich in vitamins A and D and iron. Unless children eat fish or seafood daily, they should always use salt fortified with iodine.</p>
	<p>Water is nearly 80 percent of the body and is essential to its working. It flushes out wastes, maintains the volume of the blood and keeps body salts in the right concentration. Everyone needs to drink plenty of clean water every day, especially people who live in hot climates and are physically active.</p>

The Nutrition Factsheet *Nutrients in foods* shows some foods which are rich in the various nutrients necessary for growth, energy and health.

➔ Are your schoolchildren getting enough of all kinds of food? What in particular do they need?

For most of my life, I didn't know that many parts of plants, such as pumpkin seeds and bean leaves, were also good sources of nutrients, so our family just threw them away. Helping to get this book ready has taught me that we have good food all around us, and that, with the right knowledge, even the poorest children can get the nutrients they need to thrive.

(G. Kobese, personal communication, 2005)



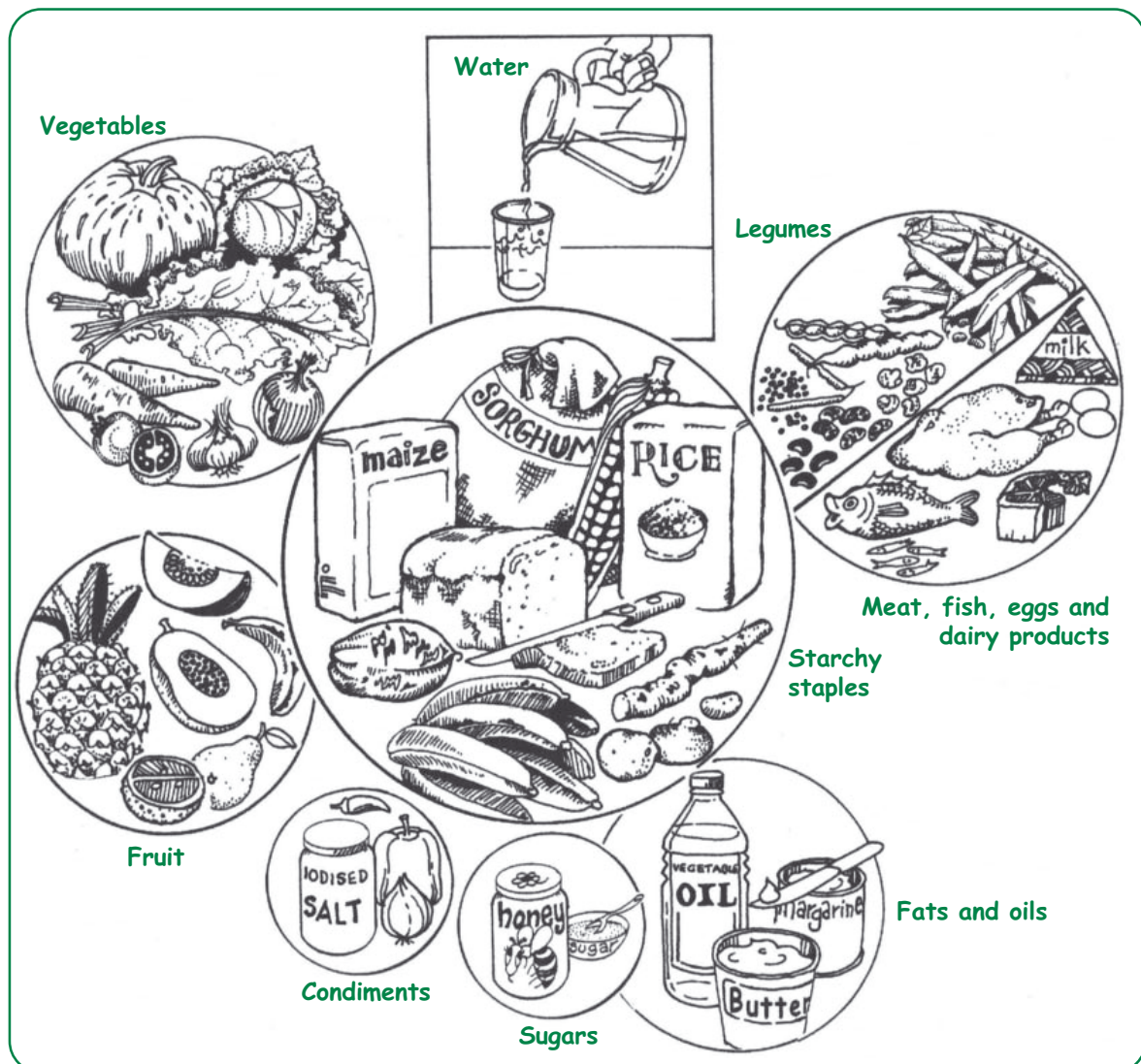


6. What shall we grow to eat?

2. Good meals

A well-balanced meal is usually based on a staple food – a cereal, root or tuber (for example, rice, potato, bread, cassava, maize). This is commonly eaten with a relish which may have fish, meat or legumes, and vegetables. Dark green leafy vegetables and orange vegetables are particularly good. A little oil or fat helps to absorb the nutrients in the vegetables. Flavouring is very important for making the meal tasty. Finally, every meal should finish with a piece of fruit.

The Family Mixed Meal Guide



→ Are your children getting well-balanced meals? At school? At home?

3. Variety

It is not enough for children simply to have *a lot of food*. It is not enough even if all their meals are well-balanced. To provide everything the body needs, we need variety: many *different* grains, roots and tubers, vegetables, fruits, legumes and nuts, and animal foods. Children need this variety every day, and all year round.

There are many reasons why people do not have enough variety in their diet. They may not be



able to get to markets. Often there are not many foods available in the market or super-market or there may be seasonal shortages.

People can run out of foods they need at stressful times – for example in the winter, when they need extra food to keep warm, or when they are doing heavy work on the land and need extra energy and nutrients. Often people do not think that variety is important, so they actually choose to eat the same foods all the time. They may think that fruits and vegetables are not worth eating or they simply do not like some foods because they are not used to them. Many children, for example, grow up eating few fruits and vegetables, and this creates habits and preferences which are hard to change later.



➔ *Are your children getting enough variety in their diet? Something different every day? Different foods throughout the year?*

Vegetables add variety

In the Toledo district of Belize, "slash-and-burn" agriculture has impoverished the soil. The local diet is mainly maize, with rice and beans. Vegetables have low status and are regarded as "hard-time food". There is widespread malnutrition.

School gardens and school meal programmes are aiming to improve the situation. They are helped by the NGO Plenty Belize with backing from UNICEF, the Pan American Health Organization (PAHO), the local university and the regional education committee. The school gardens grow calaloo, cabbage, peppers, cucumbers, tomatoes, carrots, papaya, mango and plantain. Hibiscus hedges keep out the main marauders, domestic pigs; one school collected enough money for a chain-link fence. Schools use natural methods of pest control: bug picking, intercropping and an insect spray made with onions, garlic and peppers. The produce is sold mostly to the school kitchens. Schools in the scheme meet once a month to exchange ideas and collaborate on finding donors. Families, at first suspicious, now support the gardens, because, as the project coordinator says, "agriculture is really their best bet to keep on living".



Children in Belize show off some of their harvest Photo: © Plenty International*

(M. Miller, personal communication, 2004)



6. What shall we grow to eat?



4. Frequency

Many children have only one meal a day. This is not enough. Growing children need to eat often, up to five times a day. They need something to eat before school to give them energy to study: hungry children do not learn well. A snack in mid-morning will keep them going to lunchtime. Then they need a well-balanced midday meal, a snack in the afternoon and an evening meal.

→ *How often do you think your schoolchildren eat during the day? And when?*

5. Enjoyment and culture

Food is not only fuel for the body's machine. Eating is a personal source of pleasure, a means of social bonding and a cultural practice linked with personal and social identity.

→ *Do your schoolchildren eat appetizing food, and do they enjoy eating?*

C. WHAT CAN WE GROW TO IMPROVE THEIR DIET?

1. What can the garden do?

To recapitulate, here is how the garden can help to improve the children's diet:

The questions	How can the garden help?
Are there any particular micro-nutrients lacking in children's diet?	The garden can contribute fruit and vegetables rich in vitamin A and iron.
Are children getting all kinds of food? What in particular do they need?	The garden can give vitamin-rich fruit and vegetables, legumes and nuts to increase the fat and protein in the diet, and perhaps even chicken and eggs for animal protein.
Are the children getting well-balanced meals at home? At school?	The garden can add fresh vegetables to a relish or fruit to children's meals.
Does the children's diet need more variety?	The garden can add variety, for example by growing several kinds of dark green leafy vegetable and a variety of fruit through the year.
Do the children get enough meals in the day?	Even a small garden can provide snacks and drinks and help with breakfast.
Do the children enjoy their food?	Children can learn to appreciate the appearance, smell, flavour and texture of fresh garden fruit and vegetables.

2. What foods can we grow to meet children's needs?

In general, if we want to add food value and variety to children's diet, it is not very useful to grow staple foods which children are eating already, except perhaps some maize or rice for snacks. Instead, it is good to go for several different kinds of fruit and vegetable. If there are seasonal shortages, we can also choose some foods which can be processed and stored (e.g. green leafy vegetables, groundnuts, oilseeds, beans and peas, corn, mango, banana, sweet potatoes, tomatoes).



Generally, it is best to grow local foods. Local plants have adapted to the local environment – for example, they may be able to grow in drier conditions. It may also be possible to make more use of foods growing wild. The idea is not necessarily to have new foods, but greater variety, better preparation, new combinations and greater quantities of these good local foods.

Make a preliminary list of local foods that fit your children's dietary needs. Refer to the *Nutrition Factsheets* and the *Food Factsheets* and consult local experts and home economics teachers. Make a long list which gives plenty of choice, which will really add *variety* to the diet. Think of fruits, nuts, groundnuts and oilseeds, climbing plants, leafy vegetables, root vegetables, peas and beans, and flavour foods. Get suggestions, and discuss the question with children and parents (see the outline lesson *What shall we grow to eat?* at the end of this chapter).

What does your garden grow?

In a rural area of southern Africa a dietary survey showed that schoolchildren needed more vitamin A and iron, protein, more frequent meals, food in the morning, and more general variety. The survey talked to ten schools in the area with gardens.

That year the school gardens were producing sweet potatoes (7 schools), beans (5), groundnuts (4), maize (4), palm oil (2), cassava (2), pumpkins (1), mangoes (1), chickens (1), cowpeas (1) and goats (1). On average the schools were growing three crops each. Most of them sold a third of their crops in the market and a third to teachers, and gave the remaining third to the children to take home.

Could these schools improve the children's diet by changing the crops in their school gardens? There are some ideas on the next page.

3. Do children like them? Are they easy to grow? Will they fit into our school schedule?

These practical questions will affect what you decide to grow. Most children, for example, like sweet potato, pumpkin, papaya, roasted groundnuts and other foods that can be eaten as snacks. Popcorn made from maize or sorghum is dramatic as well as delicious.



Crops should be reliable, hardy and easy to grow. They shouldn't need a lot of work and should be well adapted to the local climate and soil.

Harvest time should ideally be a few weeks before the end of the school term, to allow time for storing, preserving and consuming, and for looking back and evaluating the project. Consult the *Food Factsheets* and talk to local gardeners and experts.

If there is more than one local variety, try them all, and get students to observe the differences. You may find some that work better than others on your site. In any case it's good to promote diversity!

➔ Which foods on your list appeal most to your children, and in what form? Are your selected crops easy to grow? Which varieties will you plant?

4. What else shall we grow?

In addition to providing vital energy and nutrients, plants give us many other things.

- **For flavour and interest** grow tomatoes and onions, chilli and mustard, red pepper, lemon sage, mint and coriander. Aim to provide all the herbs and spices the school kitchen needs.
- **For refreshment** grow something to make refreshing drinks and snacks for children, visitors and helpers (see *Drinks and snacks from the garden* in *Horticultural Notes*).





6. What shall we grow to eat?

- **For added value** look for plants that give something extra – e.g. beautiful flowers, foliage, aromas, shade, compost, fuel, fodder, fences, medicines, natural pest repellents.

The **Food Factsheets** suggest how some food plants can be used in these ways. Some permanent low-maintenance crops (e.g. fruit trees, shrubs, aromatic herbs) can enhance the environment.

5. How do we grow these foods? How much can we grow? Where shall we plant them?

Together with your students, get information on *how to grow* the crops you have chosen, *how much* you can hope to grow, *how much space* you will need, *when to plant* and *how to harvest* (see the outline lesson *Crop experts* at the end of this chapter). Consult widely. This will also suggest which crops are suitable for different age groups to grow.

For each crop you have in mind, consider *where* to plant it, and *how it will combine* with others. This may mean thinking about crop rotation, intercropping, multi-layer cropping and so on (as discussed in Part 8 and in the *Horticultural Notes*).

Versatile plants

Mint and lemon grass are used in companion planting to control pests. They also make good drinks, and an infusion of lemon grass relieves the symptoms of flu. Fresh drinks can be made from mango, guava, pumpkin, papaya, banana, oranges, lemons, carrots and tomatoes. Mixing them can improve the flavour – try carrot and orange, or pumpkin juice with lemon, orange and a little sugar.

D. MAKING THE FINAL SELECTION

Before making your final choice of what to grow, make sure you and your pupils have consulted families, the health services, home economics teachers, agricultural services, the school meals service and the Environmental Health Officer. This will help you to make suitable choices and will also ensure that everybody knows what the choices are, and the reasons for them.

To help with this process, help your pupils to draw up a small table for each food you decide to grow. Use the questions in the outline lesson *Crop experts* below. This should include local information – for example, how people regard the food, how much it costs locally.

What should your garden grow? (See p. 57)

Some suggestions for schools:

- In general have more variety, for a better diet and wider horticultural experience.
- Keep the sweet potatoes, the beans, the groundnuts (for energy, protein and vitamins).
- Perhaps reduce the maize and cassava.
- Increase the fruit (more mangoes, guava, banana) and the palm oil trees.
- Have more and different vegetables (e.g. tomatoes, onions, carrots, more pumpkins).
- Have more dark green leafy vegetables of various kinds.

In addition, give the children some of the food at school in the morning.





SUGGESTIONS FOR ACTION

- Write a description of your children's diet in answer to the questions in A and B above. Get some ideas about how the garden can help.
- Explore children's and families' ideas about good diet and food values.
- Consult agriculture services, health services, home economics teachers and the school meals service about children's dietary needs and what foods can remedy them.
- Select several suitable crops for improving children's diet. Help pupils to draw up factsheets for each one.
- Do not make a final decision on what to grow until you have decided what to do with the foods when they are harvested (see Part 9).



IN THE CLASSROOM

GROWING FOOD CROPS These lessons deal with healthy diets, and what particular foods can contribute, specific food crops and deciding what to grow. They should stimulate children's interest in homegrown food as an enjoyable experience, a source of health and a personal achievement, and make good eating a point of conversation in the home.

N.B. It will be helpful to have a set of "food cards" with pictures of common local foods on them, made by the teacher or by the children.

1. What we eat *This lesson raises awareness of variety in the diet.*

Objectives Children describe their diet, become aware of how many different fruits and vegetables they normally eat and recognize the idea of variety in the diet. Teachers can use Lessons 1-3 to find out about children's diet, their feelings about food and their ideas of "good food".

Activities In class pupils build up a "food plate" with pictures or samples of foods (e.g. grains): the local staple food in the middle, animal foods on the left and plant foods on the right. They count the foods and say how many different kinds they eat in a day. For homework they keep a record of what they eat for a day or a week, and count the number of kinds of food.



2. Good eating (1) *Children and families need positive attitudes toward fruit and vegetables.*

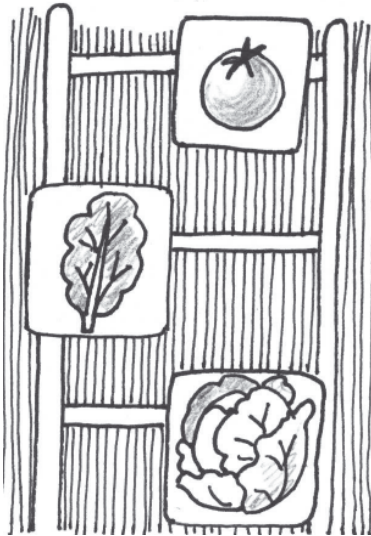
Objectives Children realize that fruits and vegetables are valuable foods, can express their personal preferences for particular fruits and vegetables, and learn to savour their smell, taste and texture.

Activities All pupils wash their hands before the lesson. The teacher shows some attractive samples of fresh fruit/vegetables, pictures and poems about them. Children say which they like best. The teacher praises positive responses and builds up the feeling of enjoyment. With eyes shut, children handle different foods and say how they feel, smell them and guess what they are, "listen" to them (shake them or break them), take a close look and describe them, then taste and eat them slowly and describe the taste. For homework they draw or describe favourite fruits and vegetables, or guess fruits and vegetables from given descriptions.





6. What shall we grow to eat?



3. Good eating (2) *Children act as "food missionaries" to their families.*

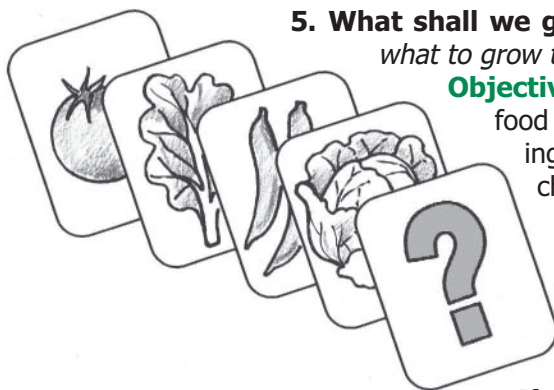
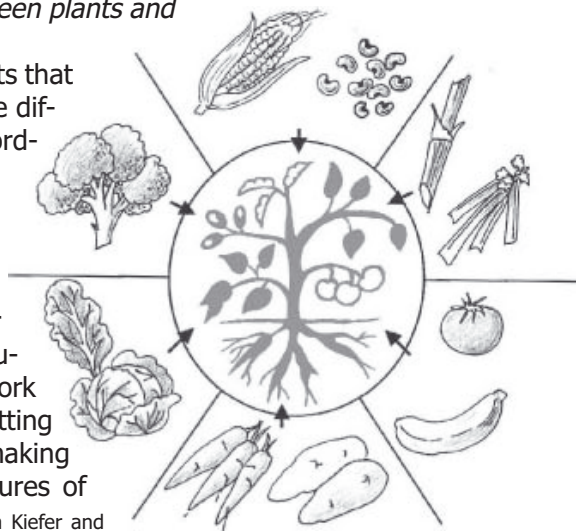
Objectives Pupils should appreciate that fruit and vegetables are essential to health, recognize the special value of dark green leaves and red/orange fruits and vegetables, and be able to express and explain some simple messages for improving the diet.

Activities Using food pictures or samples, children place common local foods on a "good food ladder", and give reasons. The teacher then helps children adjust these visible "food values", explaining that all foods are good foods, but some are particularly good. Pupils pick out all dark green leaves and red/orange fruits and vegetables and move them two steps up the ladder. Older children can use the tables in *Nutrition Factsheet 3* to find what particular foods are good for. Children follow up by drawing up take-home "food messages" based on lessons so far, or by making a "good food flag" with pictures of appropriate foods on green and orange stripes.

4. Food plants *Children make connections between plants and foods.*

Objectives Pupils are aware of the range of plants that can be eaten, are able to recognize and name the different parts of plants, and can classify foods according to the part of plant they come from.

Activities The teacher makes up a bagful of foods coming from different plant parts (roots and tubers, stems, leaves, buds, flowers, fruit, seeds) and sets up labelled stations around the class for each plant part (Root Corner, Leaf Table, etc.). Pupils label a picture of a plant with its parts, then work together to classify the foods in the bag by putting them in the correct "station". They follow up by making a labelled poster of a plant with names or pictures of foods next to each part. (Food bag idea adapted from Kiefer and Kemple, 1998)



5. What shall we grow to eat? *Children should be consulted about what to grow to eat.*

Objectives Pupils make decisions/suggestions about what food crops to grow based on preference and understanding of nutritional value, and are able to justify their choices.

Activities Children's suggestions about what to grow to eat are written or pictured on cards. For each card, the class discusses four questions *Do we like it? Is it very good for us? Can we grow it? How can we eat it – is it delicious and easy to prepare?*

If all answers are favourable, the card is displayed and the final selection is made from these. Older pupils check that the selection includes a variety of foods, the necessary ingredients for some good dishes, and foods for snacks and drinks (see



Snacks and drinks in Horticultural Notes). As follow-up, pupils tell families what foods they have selected and why, compile a snack book, or prepare advertising posters for the selected foods.

6. Crop experts *Becoming "crop experts" gives children motivation and creates "class memory".*

Objectives Children research the crops they have chosen to grow, using several sources.

Activities Pupils recall the crops they want to plant and discuss what they need to know about them. Together the class compiles a factsheet for one crop, using the questions below. Groups then select the crop they want to study, discuss what they already know and plan to find out more from families, neighbours, local gardeners, seed packets, gardening books, etc. Students report back and pin up completed factsheets. Older students prepare a presentation or an advertising campaign.



Photo: © Plenty International

Questions for crop factsheet

(for younger children, use only the underlined questions).

- Where is it grown in the area?
- Is it grown for cash or food?
- Are there different varieties?
- Is it good for us? /What is its food value?
- Do people like it and value it?
- What does it cost to buy?
- What is the best way to cook and eat it (for taste, for full food value)?
- Is it easy to grow?
- How long does it take?
- How long does it go on producing?
- How much does it produce?
- When should we plant it?
- How do we plant it and where?
- Does it need thinning/transplanting?
- How should we look after it (water/shade/support)?
- What attacks it?
- How do we harvest and store it?
- Can we preserve it in some way?
- Does it need promoting, and if so how?

(Adapted from Burgess *et al.*, 1998)



NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

PART 7: WHAT SHALL WE GROW TO SELL?



Market gardening

Objectives

- Researching the market
- Deciding what to grow and how much
- Deciding what inputs are needed
- Financial management and budgeting; planning use of income
- Keeping records; bookkeeping and accounting
- Storing/ preserving/processing the product
- Packaging and promoting the product
- Publicizing the project





7. What shall we grow to sell?



A market garden project is suitable for older pupils, since it means going outside the school and handling cash. Younger children can prepare food for fund-raising activities such as bring-and-buy sales, food fairs or raffles of garden produce, or can take part in all-age "project teams".

The practical purpose of a "market garden" project is to create income. If school funds are scarce, this is often one of the reasons why people value the school garden. But a market garden is also an excellent educational opportunity to develop business skills. Simply taking goods to market and keeping records of takings builds responsibility. Market research, budgeting, anticipating risks, drawing up a busi-

ness plan and, above all, *business thinking* are a real education for life. They can make the difference between success and failure in the small agricultural enterprises many households depend on. They will also help students eventually to apply for and handle credit. Bank managers are always impressed by a well-thought-out business plan.

However, children should not be working long hours in the garden, so it is not possible for the garden to make a great deal of money. In a market garden project, profit is not so much a goal as a token. It is needed for making the garden self-sufficient and helping the school fund. It is important for motivation, as a sign of a successful enterprise. Other powerful incentives are the opportunity for children to earn a little money for themselves, and to have a voice in what the profit is used for.

Nebiri School in Zimbabwe sold its mangoes at a discount to members of the community. But unscrupulous traders started buying up the mangoes in large quantities and re-selling them at a profit. Now the school has a rule that no one can buy more than four mangoes at a time.

(S. Ncube, personal communication, 2003)

Old villager: "When I was a kid at school, we used to ask why we were growing food for the teachers to eat. Now the school is growing food again, but it's the kids who eat it."

(M. Miller, personal communication, 2003)

It is essential that the project have the right image. Families and the community must see that the school is helping children learn useful skills, and not exploiting them for the school's profit or (worse) for the benefit of teachers. Transparency in handling money is crucial. Pupils should keep the accounts and be able to explain them. Account books should be open to the public. The whole school and parents should know how income is spent.

A. WHAT IT INVOLVES

The market garden project should be thought through from beginning to end. It will involve:

- exploring possible markets and recognizing commercial possibilities;
- deciding what to grow;
- planning the budget and drawing up a business plan;
- growing and processing the crops;
- packaging, marketing, transporting and selling the crops;
- keeping accounts and records;
- deciding what to do with profits.

Whatever the scale, the process will be the same.



The classroom The project will involve meetings and discussions, and classroom-based lessons which can be directly applied in the enterprise. Schools should discuss with Business Studies teachers how a market garden project can be integrated into their normal curriculum. If there are no such specialists, amateurs with good business instincts can help instead.

Project management Who will run the project? Pupils should be involved in the whole process and to a large extent control it. The “project team” therefore means the students, guided by their teachers. Students should also be encouraged to seek advice from families. Teams will need to share the tasks and plan the strategy. They should know from the start that working together is not always easy, and that *working in a team is part of the project*. They should assess and utilize their members’ particular talents. For example, all these qualities are useful:

- an analytic thinker for market research;
- someone who is good with figures for the accounts;
- an extrovert for sales;
- a conscientious and responsible worker to organize the gardening;
- imaginative and artistic talents for packaging and promotion ideas;
- a good co-ordinator who will encourage all the members.



Once the product is decided on, the team will open a project file to record activities and decisions. This will be used for assessment and evaluation, motivation, publicity and avoiding future mistakes.

Size The project team should decide at the beginning on the approximate scale and duration of the project – that is, how long it will take and how much time they can put in.

B. DECIDING ON SUITABLE PRODUCTS

The team should start by thinking of several possible products, then do some market research, get product information and draw up product proposals.

1. Market research

For each promising product idea, the project team must find out in a practical way if there is a demand for it, who will buy it and where, what they are likely to pay, and when is the best time to sell (see the lesson outline *Market research*). To get this information they may visit markets, ask families, talk to stallholders and interview producers.

What kind of product can we sell? Students look around their immediate environment to find out:

- what food products are bought for the home;
- what foods are grown in the neighbourhood for cash;
- what foods are needed by local restaurants, hotels, street vendors, the school kitchen, etc.;





7. What shall we grow to sell?

- what highly desirable foods are rarely available;
- what highly nutritional foods are in short supply.

They may consider herbs, seeds or seedlings, fruit or vegetables (raw or processed), ready-to-eat food, preserves or drinks, or crops that can be turned into artefacts – for example, gourds can be made into containers, bowls, dippers and ornaments.



What is its “added value” or selling point? New products are difficult to market. A well-known product with a new aspect has more chance. The team must ask what is *special* about their product, what makes it different. For example, people might want to buy it because it is:

- high quality
- attractive or delicious
- highly nutritious
- available out of season (e.g. sun-dried fruit)
- cheap
- convenient (e.g. carried home by pupils)
- organic
- produced by the school.

If nutritional value is a selling point, the team will need advice on local nutritional needs and the nutritional value of various foods (see the Nutrition Factsheet *Nutrients in foods*). They

may, for example, consult the home economics teacher or the local clinic.

Who will buy it and where? The project team should decide on the best “sales outlets” for them:

- the local population, through local shops, markets or roadside stalls;
- the school population, through snack stalls run by pupils, through vendors, in class;
- parents and families, through pupils, or at school events like food fairs;
- the school as a whole, through the school meals service.

It is far more educational if the students are involved in the actual selling, rather than handing this over to a professional stallholder or shopkeeper. However, good arrangements can be made with local outlets. For example, local food producers may be interested in contributing to a weekly school stall if it attracts a lot of people. Restaurants or bars may be prepared to buy a particular product over a certain period. In such cases it is advisable for teachers to make the first approach, and then send in the students to negotiate if it looks as if they will be welcomed.

How much will they pay? When should we sell? The team must find out what prices are competitive, what the range of prices is and how prices change seasonally. They may decide to aim for an out-of-season product that will fetch higher prices, like the *Mango Chews in the Box* on page 68.

How do we promote it?

Every product needs a name. A product can be promoted with a poster, by word of mouth, in a slogan, by sales talk over the counter. If the “selling point” is new to the buyers, it too

When calculating the sale price of a product, it is important to consider the costs involved with production. Even something as basic as the germination rate of seeds can affect the end price of seedlings or jam.





will need promoting. For example, if the product is highly nutritious, then customers must be convinced of its nutritional value. And don't neglect other virtues – it may also be delicious and cheap. Sales points usually come in threes!

Sales ideas are important. Promotion usually makes a difference. However it needs forethought and organization, and also usually entails costs. The project team should have some ideas at the beginning and develop them while the crops are growing.



2. Product information

The team will also need to discuss some technical and marketing questions in order to develop more complete product proposals and identify the inputs needed (see the lesson outline *Product information*). The discussion may also raise questions about important principles – for example, safe food, respect for the environment, investment in infrastructure, truth in advertising.

Can we grow it? How do we grow it? Are the crops easy to grow, hardy and reliable? Do they start from seeds or seedlings? How much work will be required? Will the crops come to harvest in time to package and sell them before the end of the school year?

Technical advice is also needed on how to get the best results – when to plant, how to cultivate, what pests and diseases to look out for and how to deal with them, when and how to harvest, how to store the crop (see Part 8: *How do we grow things?*).

The team should decide if they will adopt any principles apart from short-term profit. For example, will they insist that the project put back into the soil what it took out? Should it make improvements in the garden infrastructure?

How do we process it? If the product requires processing, what equipment will be needed? Can it be borrowed, bought, hired or made? How will students learn how to do the processing? What hygiene rules must be observed? If produce is to be stored, what kinds of containers are needed to protect it? The project team must go into all these questions. Environmental officers, Home Economics teachers, Food Safety inspectors or the Ministry of Health may be able to give advice.

How shall we package and label it? Packaging need not be costly, but it must be attractive and hygienic. If the product is for keeping, packaging should be airtight and pest-proof. Labelling is an important aspect of sales. It is also a highly educational activity that introduces students to legal obligations and to advertising strategies such as high-impact designs and arresting wording. Will there be lettering on containers or packaging? The project team must consider how it is to be done – by hand? printed? duplicated?



How much time will it take? Once the product team has gathered this information, they should estimate the time required for the project, both regularly and at periods of peak activity (e.g. harvesting, processing, packaging and sales). This may affect the scale and timing of the operation (for example, avoiding exam periods).



7. What shall we grow to sell?

3. Product proposals

By doing the above research, some over-ambitious or unrealistic ideas can be eliminated. For the most promising products, the information collected can be summarized on an information sheet as in the Box below. This document is for the entrepreneurs themselves, not for the public.

Product information for *Mango Chews*

Name of product	<i>Mango Chews</i>
Product	Sun-dried mango slices.
Kind of product	Snacks for children to eat at school and at home.
Nutritional value	Rich in vitamin A and high in energy.
Added value/selling points	Can be eaten out of season and lasts a long time. Keeps you healthy. Delicious. Gives you energy to study.
Who will buy it and where?	Students and families. Students will take them home and they will be sold at a school stall at break.
What will they pay?	We estimate they will pay the same as they pay for cakes and buns from the street vendor – 20 cents.
When should we sell?	Start selling two weeks after the fresh mangoes are finished.
Can we grow it? How do we grow it?	The trees are already in the school grounds – no planting, cultivation or pruning is needed.
How do we harvest it?	The mangoes should be picked when they are half ripe and not full of fibre. Pick by hand to protect the fruit. Choose perfect fruit.
How do we process it?	We will use a solar drier, which we have to build. a) We wash the fruit, peel it (with clean knife and clean hands) and cut into slices. The peel and stones go into the compost. b) We make a solution of 1 litre of water, 700 grams of sugar, 3 grams of potassium metabisulphite and 2 spoons of lemon juice for every 2 kilos of fruit. c) We soak the slices for 18 hours, then drain them. d) We put them on greased trays in the solar drier and dry for 3-4 days. e) We check for quality then weigh out 200 gram portions.
How do we package it?	We put the fruit in cellophane bags and seal with a label giving name, weight, ingredients, origin, process date and storage life.
How do we promote it?	a) We keep the whole school informed of the project and have a competition for the best logo. b) While the mangoes are fresh we make mango juice for students and remind them that they can have mangoes all the year if they wish. c) We ask students to tell families our slogan: <i>Mango Chews keep you healthy all year.</i> d) We give away free samples in the first two weeks of sales.
How much time will it take?	We will need ten hours a week for a month for preparation, 20 hours a week for the month of fruiting; five hours a week for six weeks during the sales period. This adds up to 150 hours (that is, 30 hours each for five people, 15 hours each for ten people).

(Adapted from FAO (no date) *Rural Processing and Preserving Techniques*)



C. DRAWING UP A BUSINESS PLAN

The *business plan* is a document drawn up by the entrepreneur and reviewed by loan organizations or bank managers. Its purpose is to decide if a proposal will work financially – i.e. make a profit. It

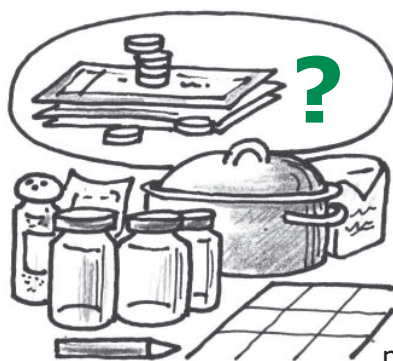
- outlines the project idea and the marketing strategy;
- gives figures for projected income, costs and profits;
- explains how profit will be distributed;
- discusses risks and how to avoid them.

To draw up the business plan, the project team must find specific answers to these questions:



How much do we plan to produce? Estimating quantities is a good test of the team's sense of realism and helps them to calculate the inputs needed. They should decide:

- how much land they can cultivate easily;
- how much they can plant on the land;
- what yield they can expect;
- how much of the finished product the yield will produce.



What will our costs be? What inputs will be needed? Where should we get them? What will they cost? It is important that costs are worked out in a businesslike way, as if this was a real micro-enterprise in the outside world. It will help students to think clearly about finance. For example:

- The project team's labour should not be included as a cost. Instead, the team shares in the profits.
- Rent for the land would probably be very little even if the school decided to charge it. But if the school is lending the project tools, transport or equipment, providing water, or paying for seeds, these must be included as costs to be paid off out of future income.
- Once students have got used to analysing costs they can be introduced to the idea of *fixed* and *variable* costs and the effect of scale on profitability. If they produce more, will this increase the *rate* of profit?

What will we do with the profit? Once there is a firm prospect of a profit, the team should discuss what to do with it. Some possibilities are:

- putting money back into the garden;
- contributing to a school improvement project;
- paying for a final celebration;
- sharing out some of the profits among the project team;
- paying students to look after the garden in the vacation.

If the project team decides to contribute to the School Fund, make sure that this contribution is earmarked for a particular project and not simply "lost" in general-purpose expenditure. Everyone should know what was contributed by the market gardening group and what it was spent on.

What are the risks and how can we avoid them? To tackle this question, divide the project into stages and think of what might go wrong at each stage and how to fix it. For example:

- Stage 1: getting the inputs (not available, too expensive, poor quality);
- Stage 2: cultivating the crop (water shortage, pests and diseases, labour problems);



7. What shall we grow to sell?

- Stage 3: harvesting and processing (equipment breakdown, too much work to do);
- Stage 4: packaging and transport (packaging unavailable, transport too expensive);
- Stage 5: sales (wrong time, wrong place, wrong people).

After researching and discussing these questions, draw up the business plan (for an example, see the lesson outline *Business plan*). Put it in the project file.



D. IMPLEMENTING THE PROJECT

Finally, the project needs an action plan (see Part 10). This will show all the project activities and put them in a time frame. Particularly important for young entrepreneurs are:

- clear objectives embodying the principles discussed;
- record-keeping – a good habit which does not always come naturally;
- publicity, since self-presentation is one of the keys to business success;
- evaluation, which will tell the project team if their enterprise was a winner.



1. Objectives

A business enterprise generally measures its success by its profit. The project team must discuss if this is their only criterion. They may also want to adopt other aims or principles to guide their actions – e.g. truth in advertising, respect for the environment, investment in infrastructure, fame for the school. These will also be project objectives.

2. Keeping records

The *project file* should contain a complete record of the project, including:

- the objectives
- all product information
- the business plan
- the action plan
- the accounts
- the project journal
- photographic records, if any.

Book-keeping The project team should learn to keep accounts and take turns at it (see the lesson outline *Book-keeping*). Short and simple accounts can be displayed, and the project team should be able to explain them.

Project journal A regular journal should be kept of project progress, including:

- a log of work done and the time taken;
- problems, incidents, action taken – e.g. notes on pest sprays used, advice given, weather, market conditions, discussions among the project team, etc.;
- records of production – when harvested, quantity, etc.



If the project is to be assessed, the team can compile a project portfolio.

Photographic record Take clear attractive photographs of the process and the product.



3. Publicizing the project

Marketing a product is already publicity. But if the project is successful, blow the trumpet a little more loudly! Students and teachers can talk about it to organizations, the whole school, youth groups, the parent-teacher association or the School Board. This promotes good food, gives young people business ideas, raises the reputation of the school, makes the team feel good, gives practice in making presentations, and attracts new sponsors.

All records are useful in publicizing the project, especially pictures, photographs, quotations and anecdotes. For local radio programmes or newspapers, prepare a half page of important points, and include a picture which will look good in black and white.

4. Evaluation

Evaluation should pick up the projections in the Business Plan (see the lesson outline *Evaluation* in Part 10). Some questions are:

- Was the profit worth the labour we put in?
- What did we not anticipate?
- Did we get the costs and the selling price right?
- Did we fulfil our aims?
- Did we make a profit in the predicted range?
- Did we dispose of the profit as we planned?
- What lessons have we learned?



SUGGESTIONS FOR ACTION

- Meet periodically with Business Studies teachers to discuss how to incorporate the project into the curriculum.
- Get students to organize project teams and think of marketable products. Take them through all the planning stages above, finishing with a business plan and an action plan.
- Present business plans to the Garden Group and discuss needs.

Outputs: Ideas for suitable products
Business plans
List of needs

TIPS AND IDEAS

- To encourage entrepreneurial spirit, product teams compete for a prize or a title (e.g. Entrepreneurs of the Year) or submit rival proposals for projects.
- Have a competition for the name of the product, the logo and the packaging design.
- Train students to make poster presentations of business plans to the Garden Group/parent-teacher association.
- Encourage students to cultivate individual plots for pocket money and report on them at the end of the year. Have a competition for the best researched or the most profitable.
- Set up a "token economy". Pupils "sell" produce to the school food shop for tokens and "buy" produce with tokens earned by working in the garden.
- Pay for work done "in kind" – children earn fruit and vegetables by extra weeding, making deliveries in the village, taking food to market, etc.
- Invite local entrepreneurs, market gardeners and business people to talk about their problems and successes and to comment on students' product ideas and business plans.





IN THE CLASSROOM

MARKET GARDENING These lessons, which are for older children, take students through planning and carrying out a market gardening project.



1. Market research *This introduction to market research needs a double lesson.*

Objectives Students recognize the importance of market research, brainstorm product ideas and carry out simple market research.

Activities Students prepare by finding out about local cash crops, prices and outlets, and by thinking about market opportunities. In class they hear a cautionary tale about young entrepreneurs who did not do their market research, and analyse why they failed. They then brainstorm product ideas, considering a variety of products and outlets (see below), write ideas on

cards and pin them up. They choose one "product idea paper" (PIP) and discuss five questions: a) What will be special about the product? b) Who will buy it and where? c) Which markets are best? d) What will customers pay? e) When is the best time to sell? For homework each group selects another promising PIP and researches the same five questions.

- **Possible outlets:** shops, market, roadside stalls, home delivery, school events, church socials, youth clubs, school snack stalls, school meals, local restaurants, cafés or snack bars.
- **Possible products:** aromatic or medicinal herbs; seedlings, seeds or pot plants; raw food; processed or preserved food; ready-to-eat dishes, drinks and snacks; bags of compost; firewood and kindling; other garden products, e.g. gourd bowls, homemade pest sprays, flowers, baskets, loafahs, eggs, brooms, brushes.



2. Product proposals *Bring in "consultants" with real experience from the world of business.*

Objectives Students learn to consult appropriate experts and to present product proposals.

Activities Students report on their market research, talk through their PIPs and say how successful they think these ideas might be. The class chooses the most promising idea(s) and finds names for them. The class may then divide into teams, each with special responsibility for production, accounts/records, sales and publicity. Those responsible for records file project ideas and record names of team members. For homework students research the selected crop(s) using the Crop Factsheet and consulting appropriate experts (e.g. horticulturists, smallholders, home economics teachers).

- *The crop factsheet* should follow the questions in the lesson outline for *Crop experts* (Part 6), with these extra questions: What packaging/labelling will the product need? Are there any by-products we can use or sell? What inputs will we need to grow and market this product (e.g. transport, tools, equipment, seeds, water, packaging, ingredients for cooking/preserving, publicity)? How much will they cost? Where can we get them?



3. Product information *Students gather the information needed for the business plan.*

Objectives Students assemble essential information about the product and the inputs required; they recognize the roles in developing a product and what they involve.

Activities Students are introduced to the ten questions to be answered for creating a business plan (below) and check off those they have covered (1-3). They report on product information they have gathered and file it in the Project File. The class then deals with questions 4 to 6. They discuss the scale of production (how much land, how much time, what quantities) and make rough numerical estimates. They draw up a list of the inputs required, where to obtain them and roughly what they will cost; these are recorded by the Records Team. Students discuss and decide who will be responsible for obtaining each input.



Questions for the business plan

1. What are we going to produce?
2. How do we do it?
3. How and where will we sell our products?
4. How much do we plan to produce?
5. Where will we get our inputs?
6. What will our costs be?
7. What will our income be?
8. How much profit do we expect to make?
9. What are the risks and how can we avoid them?
10. What will we do with the profit?



4. Profit budget *This lesson deals with the big money questions (7 & 8 above).*

Objectives Students estimate the profitability of possible products.

Activities Using the example below, students learn how to draw up a table of projected costs and income and calculate potential profit. Using their own list of inputs, they then do a cost analysis for their own project. They tick off questions 7 and 8. For homework they reflect on what risks the project might face and what should be done with any profit (questions 9 and 10).

Cost analysis of tomato project

INCOME	Product	Quantity	Sale price per unit	Total value
	Tomatoes	50kg	\$2 per kg	\$100
	TOTAL			\$100

COSTS	Item	Quantity needed	Price per unit	Total cost
	Seeds	5 packets	\$2	\$10
	Fertiliser	5 bags	\$5	\$25
	Paper bags	100	\$10 per 100	\$10
	Market licence	1	\$5	\$5
	Transport	4 trips to market	\$3	\$12
	Hire of tools			\$4
	TOTAL			\$66

EXPECTED PROFIT	\$34
------------------------	-------------



7. What shall we grow to sell?



5. Business plan *This lesson is for making the business plan presentable to the public.*

Objectives Students anticipate risks, discuss what to do with profit, draw up a business plan and present it.

Activities Students describe the risks they have thought of, suggest how to avoid them and note down the ideas. They also discuss what they would like to do with the profit. Ideas are recorded, but final decisions are left to later in the project. Students are introduced to the Business Plan form (below). They write up their business plan and practise presenting

it. Teams then outline their action priorities and make a note of what is to be done and who is to do it. To follow up, students make real presentations (e.g. to the parent-teacher association, the Garden Group, other classes).

The business plan form

Name of group Class

Name of project & product

Project description

Period of project: from (month, year) to
..... (month, year)

1. Estimate the profitability of the enterprise (attach the cost analysis)
2. Where will you get your inputs?
3. How and where will you sell your products?
4. What will you do with your profit?.....
5. What are the main risks, and how will you reduce them?.....

(Adapted from Heney, 2000)

6. Marketing and publicity *Promoting a product is very educational for the promoters!*

Objectives Students become aware of the value of marketing and promotion, study and select marketing strategies and implement them in a coherent marketing programme.

Activities Students study some familiar products and their marketing strategies, and brainstorm ideas for their own product(s) (see below). They then select a few approaches which they think will have an impact in their context. To follow up, the publicity team prepares and presents a marketing plan.



Thinking of marketing strategies

- Recall the product's main selling points.
- Decide the overall marketing approach (e.g. special service, personal delivery, door-to-door publicity, word of mouth, poster campaign, packaging, special offers).



- Invent a product name, logo and slogan and decide how they will be used.
- Design packaging and labelling (remember food hygiene and essential label information).
- Think of advertising and promotions (e.g. banners, fliers, displays, gimmicks).
- Brief project personnel and salespeople.

7. Book-keeping and records *Keeping accounts is useful even if there is very little cash flow.*

Objectives Students keep track of daily income and expenditure, recognize the need for transparency in accounting and act on it.

Activities Students discuss the value of keeping accounts (as a reminder, for accountability, for transparency, to assess profitability). They follow the record of a market trader's day, income and expenditure (see below), and understand that we add on the difference between income and expenditure on the right (so the two sides add up to the same) to check that we haven't made a mistake. They then practise making the entries for other fictitious cash-flow scenarios. Finally, they receive a cash book for their own project and decide who will use it and how.

ELIZABETH'S CASH BOOK Elizabeth sells tomatoes, onions and okra in the market. This is one day's page from her cash-book. (N.B. The boxed 1000s mean notes)					
<i>Elizabeth starts with 8,000 cash in hand.</i> <i>In the morning she buys:</i> - 2 baskets of tomatoes at 2,000 each - 1 bag of onions at 2,500 - 1 basket of okra at 1,200 <i>During the day she sells:</i> - tomatoes for 1,000 - onions for 600 - okra for 400 <i>She also takes 600 for herself to buy food for the household.</i> <i>At the end of the day she has 1,700 left. So next day she starts with 1,700 cash in hand.</i>					
1-9-93	⊕	₹	1-9-93	⊖	₹
1-9-93	1000	8 000	1-9-93	☹ 2 x 2000	4 000
1-9-93	☹	1 000	1-9-93	☹ 1 x 2500	2 500
1-9-93	☹	600	1-9-93	☹ 1 x 1200	1 200
1-9-93	☹	400	1-9-93	☹	600
		10,000			8 300
			1-9-93	1000	17 00
				10,000 - 8300	10,000

(Adapted from Heney, 2000)



NOTES

[illegible]

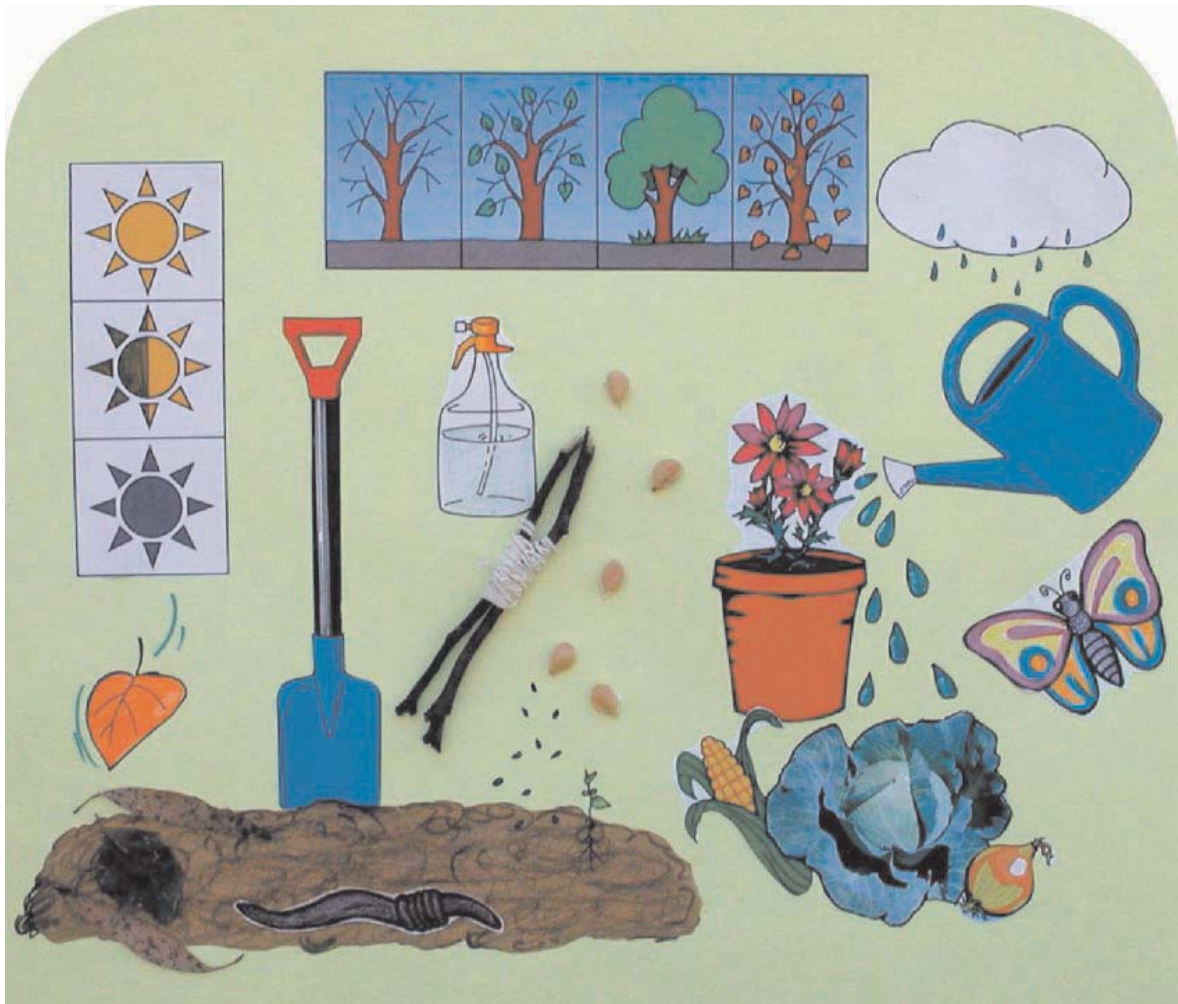
PART 8: HOW DO WE GROW THINGS?



Gardening methods

Objectives: Deciding strategies and learning needs with regard to:

- planting – what, how, when and where
- maintaining the soil
- using tools
- getting good seeds and seedlings
- caring for plants: watering, feeding, weeding
- caring for plants: pest management
- harvesting, storing and preserving





8. How do we grow things?



How do we grow things? What should children learn about growing things? The “garden curriculum” responds to questions like *How do we keep the soil rich? How do we sow seeds? What do we do about pests?* Some of the answers are always the same. Some differ according to local circumstances, practices and ideas. You need to decide what methods you will use in your school garden. This will also affect what you decide to grow.

Some widespread and successful techniques and practices are set out in *Horticultural Notes*. Many of them are organic approaches, advocated by this Manual (see *Organic gardening in Horticultural Notes*). You should compare these approaches with your own experience, your resources, the practices in your area and what the children can manage. Ask yourself these questions:

- Are we familiar with this approach? Is this how it is done around here?
- Do we want to do it this way? If so, do we need to convince others?
- Can the students manage this? What in particular do they need to learn?

If some approaches are new to you, take advice from local gardening experts. By discussing these questions you should arrive at a “gardening curriculum” which fits your circumstances.

A. GARDEN ACTIVITIES

1. How do we keep the soil rich?

Growing plants takes nutrients out of the soil. In nature, plants usually die where they grow and give back these nutrients to the soil. But when we harvest crops, we take away what the soil produces, to eat it or to use it. In doing this, we take the richness out of the soil, and we must put it back in some way. This is the point children need to understand.

There are several good ways of keeping the soil rich:

Compost and mulching Manure, compost and mulching put back a lot of organic matter into the soil. Consult the *Horticultural Notes* on compost, watering plants and mulching.

- ➔ *Are these the normal practices in your area? Can you do them in your school?*
- ➔ *If you plan to make compost, when should you start? (It takes about three months to mature).*
- ➔ *Children and families can contribute to the compost. How can this be organized on a long-term basis? How can they become enthusiastic about compost, “brown gold”?*

Minimum tillage If you have decided to have raised permanent beds, the best policy is “minimum tillage” (see *Garden beds in Horticultural Notes*) – that is, *leave the soil alone* and let nature do the cultivating. Roots, compost, worms and bacteria will work together to build up a good soil structure. Once the bed is established, deep ploughing or digging should be avoided as it will destroy this living structure.



- ➔ *Is “minimum tillage” the practice in your area? Will you need to convince anyone?*

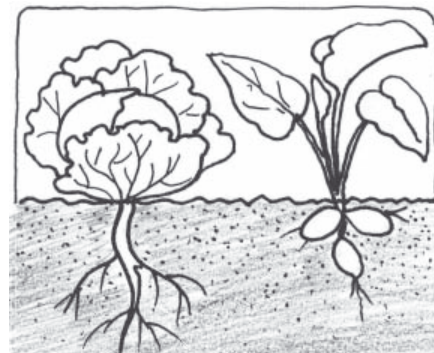
Crop rotation Different crops take nutrients from the soil in different amounts. They also take them from different levels in the soil. To keep the soil rich it is essential to *rotate crops* – that is, to have *a different crop, from a different plant family* in the bed each season. The cycle of changing crops should last at least four years. Alternating deep-rooted crops and shallow-rooted ones



also gives the different levels of the soil a rest. Consult *Rotating crops* and *Intercropping* in *Horticultural Notes*.

If you decide that pupils should learn to rotate crops, they will need to make a map of crops planted each season. It also helps if the class keeps the same plot as it goes up the school, so that the students can control the placing of the crops each year.

- ➔ *Is crop rotation the norm in your area?*
- ➔ *Can you use it in the school garden?*
- ➔ *Will you include it in your teaching?*



Multi-layer cropping Growing plants of different heights and habits together allows you to make best use of the soil (see *Intercropping* in *Horticultural Notes*). Usually the taller plants are perennials such as papaya and passion fruit, while the shorter annual crops go through the rotation.

- ➔ *Is there room for some tall perennials between your other crops? What could you plant?*
- ➔ *Will you teach children explicitly about intercropping?*

Crop rotation in school gardens

In school gardening you need to compromise between good agricultural practice on the one hand, and nutritional, educational and motivational needs on the other. No one wants (for example) to spend a whole year studying and eating only carrots! Luckily, the space you give to each crop does not make much difference to the principle of crop rotation. Diseases do not spread far in the soil, so you can rotate small areas as well as large. For example, a commercial grower might have one field under cabbages, another under beans, one with carrots and a fourth with Swiss chard, and rotate the four crops every five seasons, with a fallow interval. A school class could have the same four crops in a door-size garden, with an empty strip and a "green manure" crop like sunflowers or alfalfa (lucerne):

3 lines green beans	4 lines Swiss chard	4 lines carrots
5 cabbages	Empty strip or sod crop	Sunflowers or alfalfa

(Adapted from Valley Trust Nutrition Education Programme, 1995)

It is even possible to rotate crops in a tiny "nutrition square" only 1m x 1m, as in "square foot gardening". These layouts make crop rotation more visible and at the same time emphasize the value of variety for good nutrition.

2. How do we use the tools?

What tools are used in your area, and how? Do children know the tools and how to use them? (See Part 5.)

Safety with tools is particularly important with children. What precautions should you take and what practices should be established?

What rules should be established about keeping tools free of rust, sharing them responsibly and, above all, putting them away after use?

- ➔ *Is there anything which needs emphasizing particularly strongly with your pupils?*
- ➔ *Does your school's insurance policy cover garden accidents with tools and equipment?*



8. How do we grow things?

3. How do we get good vegetable seeds?

You need seeds which are strong and disease-free. Local varieties will do best. Your options are:

Seeds and cuttings from the community These are probably well adapted to the climate. However you cannot be sure that they are strong and disease-free. Plant them separately, label them, get children to monitor them and see how they do.



Bought seeds These are more expensive, but generally it's advisable to buy seeds commercially and use them in the specified period. Try to get donations from a local seed retailer, but check that they are not out of date: vegetable seeds deteriorate quickly (cereals and legume seeds last longer).

Your own seeds Sometimes you can take seeds from your own plants if they are non-hybrids. This is the cheapest solution and can help to improve plant stocks. It is also very educational: learning how to select, collect and store seeds and take cuttings are valuable lessons for children. Select the best and strongest plants; avoid the common mistake of "negative selection" (taking seeds from weak or diseased plants).



- ➔ *Is there anyone who will donate seeds or cuttings to the school garden?*
- ➔ *Can you get seeds more cheaply by mail order rather than from a local supplier?*
- ➔ *Can you save some of your own seeds?*

4. How, when and where do we plant?

How Large seeds can be planted directly in the soil. Small seeds require a seedbed or nursery bed. This may be a box, tray or bag; a protected nursery bed; a seed tray (re-usable plastic ones are the most economical); or a seed nursery in classroom. Seeds will then need thinning and hardening off before transplanting. Some standard procedures are described in the *Horticultural Notes* under *Planting and transplanting* and *Sowing seeds*.

- ➔ *How do you plan to do it?*

When Get local advice about when to plant, as the climate of the region generally dictates the best time. You will also need to fit the planting into the school term, and to go on planting over a period if you want continuous cropping.



- ➔ *What are the practices in your area? What would you like to try?*

Better late....

A teacher in the Gambia planted onions in the school garden. He faithfully followed the instructions on the packet. An elderly woman down the road warned him it was too early, but he ignored her because he thought she was ignorant. In the end, the teacher's onions failed, while the elderly woman's onions (planted later) flourished. The later planting avoided the worst effects of the dry season.

(Cederstrom, 2002)

Where? Some of the possibilities are described in the *Horticultural Notes* under *Rotating crops*, *Intercropping* and *Companion planting*.

- ➔ *Do you want one crop in each plot, or several crops in one plot?*
- ➔ *Will you use intercropping to control pests?*



5. How do we look after the plants?

Regular tasks in the garden are watering, mulching and weeding. These fairly repetitive chores become more interesting when children are learning the right way to do them, doing them together, showing each other how and seeing the effects of their work.



Watering Regular watering is essential for most plants. There are more and less effective ways of doing it. All gardening beginners need to recognize when water is needed, to know how much is enough and to learn to water *earth*, not *leaves*! (See *Watering Plants* in *Horticultural Notes*.)

→ What are the watering practices in your area? What do your children need to learn?

Mulching is covering the ground around plants with dry organic material. It is excellent for preventing weeds and keeping moisture in the soil. It slowly increases the organic content and prevents the earth from baking into a hard crust. There is some advice on mulching in the *Horticultural Notes*.

→ Is mulching a common practice in your area? What local material is suitable for mulching? Is this something pupils need to learn to do?



Weeding There's an art to weeding, too. You must catch weeds before they seed, and make sure you get the roots out or cut off the weed below the surface of the soil. Weeding can be quite a satisfying activity because the effects are visible, and weeds themselves are an interesting study in plant competition. Some attract beneficial insects; others make a good contribution to the compost heap. Check the advice about weeding in the *Horticultural Notes*.

→ What will your pupils need to learn about weeding?



6. How do we fight pests and diseases?

With "integrated pest management" (IPM) you can avoid a lot of expense while also protecting the environment (see *Healthy plants* in the *Horticultural Notes*). IPM conserves beneficial insects, protects bird life, saves money and protects the soil. It also encourages children's observation and helps them to understand the whole ecosystem. Here are some of the main IPM strategies.

Healthy plants The first way to fight diseases and pests is by helping plants stay healthy. Some ways to achieve this are:

- choosing strong disease-free seeds and seedlings;
- planting them in raised permanent beds;
- feeding the soil well with compost;
- watering regularly;
- getting rid of plants with diseases and pests;
- mulching to reduce competition, keep in moisture and feed the soil;
- companion planting (i.e. planting some crops together).

Crop rotation Rotating crops not only maintains the soil but also reduces disease (see *Crop rotation* in *Horticultural Notes*). Each kind of crop has its own particular diseases and pests. Some of these stay in the soil after the harvest and lie in wait for the next crop. The same kind of crop in the same place will probably get the same disease again. Different kinds of plant are much less at risk.

Too much of a good thing

A farmer in Tanzania got a grant to install a drip irrigation system. The first year he grew cabbages. They were big and sold well so he planted them again next season in the same field. And the next season. And the next. By the end of the second year his irrigation system was still fine but his cabbages were small and diseased.



8. How do we grow things?

Companion planting Planting some crops together helps to control pests. Herbs with strong smells can put harmful insects “off the scent” and keep them away from vegetables. Some destroy harmful organisms in the soil. Some flowering plants attract beneficial insects which destroy harmful ones. For more details see *Companion planting* in the *Horticultural Notes*.

Attitudes to insects Some insects are good for plants and some are harmful. Butterflies and bees, for example, should be encouraged as they pollinate the plants; mantises and ladybugs prey on harmful insects. Children need to be able to distinguish between “garden friends” and “garden enemies” (see *Beneficial garden creatures* and *Pests* in the *Horticultural Notes*).

Most pesticides kill all insects, and this is harmful to the plants. Children should know that there are more environmentally friendly ways of dealing with pests. Some pests can be eliminated by simply picking them off when they first appear. Some can be dealt with using a cheap soap and water spray – see *Homemade sprays* in the *Horticultural Notes*. Consult *Plant problems* in the *Horticultural Notes* to see what alternative approaches children can learn.

- ➔ What are the normal practices for pest and disease control in your area? Is there heavy use of pesticides and fungicides?
- ➔ Do you plan to practise integrated pest management? If so, how will you explain it to children and the community? How will you organize children to monitor plants and find solutions to problems?

Our school practises crop rotation – for example, cabbage, red peas, corn, yam in succession. We also have plants with strong smells as companions to outsmart the insects – marigolds, peppermint and leeks. One local farmer copied the school garden and planted marigolds all through his cabbage crop. The children said it looked like a field on fire!

(C. Power, personal communication, 2003)



7. How do we harvest, store and preserve crops?

What do children need to know about harvesting? (Check *Harvesting* in the *Horticultural Notes*.)



Are you planning to store crops or preserve them? This is important if you are growing food to keep or for lean periods of the year. *Conserving and preserving* in the *Horticultural Notes* shows a few forms of safe storage and some ways of preserving food – e.g. drying, bottling and pickling. See also Part 9 D below.

- ➔ Are you familiar with ways of preserving food? What methods are practised in your area? How much do children already know about them?
- ➔ Do you plan to use new methods?

* * *



8. What if it goes wrong?

Something always goes wrong! Even if you yourself are a gardening expert, you are working with learners. You may also be trying out new plants or new methods. But everything that goes wrong is an opportunity for communication, observation, experimentation and learning. As you can see from the box below, most interesting enquiries spring from problems.

A school science exhibition in Zimbabwe

Some prize-winning projects in the Inter-Provincial Campfire Science Exhibition:

- Excessive carrot wastage at Gaza primary school. Children found that they were throwing out a lot of carrot seedlings before transplanting. Why?
- Stunted tomatoes in Amaswazi School. What was the cause? What was the cure? Children tried different types of manure to increase the yield.
- The high rates of leaf curl on leaf vegetables at Dyaramiti School. Is this caused by too much chemical fertiliser?
- Does urine as a fertiliser improve maize yields at Charter estate school in Chimanimani?

(L.Chinanzvavana, personal communication, 2003)

B. RECORDING YOUR STRATEGIES

Before making final decisions on gardening methods, consult local gardeners and take expert advice. You may find it useful to draw up a list of the approaches you would like to adopt for discussion with the Garden Group, children, parents, etc. Use a table like the one below.

	Approaches to be adopted
Maintaining the soil	
Using tools	
Getting good seeds/seedlings/cuttings	
Planting and transplanting – how, when, where	
Tending plants – watering, mulching, weeding	
Pest and disease management	
Harvesting, storing, preserving	



SUGGESTIONS FOR ACTION

- Consult local gardeners and technical experts, and draw on your own experience, to decide what gardening approaches are most suitable for your situation.
- In particular, discuss organic methods in the area. (Use the entry on Organic gardening in the Horticultural Notes to aid discussion.) Decide how far the school can go in adopting these approaches.





8. How do we grow things?

- If you plan to rotate crops, make a map of existing crops, or get pupils to do so.
- Decide what particular learning points you will need to emphasize with your pupils.

Outputs: Decisions on methods and techniques
 Map of existing crops
 Useful lessons marked for your personal use

TIPS AND IDEAS

- If you are confident you can make organic approaches work, persuade the school to adopt some Good Resolutions – e.g. *In our garden...*
 WE WILL PROTECT THE SOIL AND CONSERVE WATER
 WE WILL USE PLENTY OF COMPOST AND MULCH
 WE WILL ROTATE CROPS
 WE WILL NOT USE ARTIFICIAL FERTILISER
 WE WILL BRING ORGANIC RUBBISH TO SCHOOL FOR COMPOST
 WE WILL DO A BUG PATROL EVERY MORNING....

Post up the resolutions near the garden and discuss them with children. Show them to visitors and get children to explain them.

- Start a Bug Board: a display of pests, with names, information and recommended treatment.

Caution: If organic approaches are innovative for your district, promote them by example rather than by publicity, and make sure they are successful before you recommend them to others!



IN THE CLASSROOM

GROWING PLANTS These lessons prepare children directly for gardening tasks and should generally be done in the growing period.

1. Sowing seeds *Sowing big seeds directly in the garden is easy for young children.*

Objectives Pupils get local advice on planting seeds, sow seeds directly in the garden and care for seeds and seedlings correctly.



Activities Pupils recall what plants like (rich soil, space, no competition, warmth, moisture, light). They look at the seeds to be planted and suggest what dangers they face (e.g. trapped under stones, washed away, waterlogged, eaten by birds/slugs, overgrown, scorched by sun). They decide an appropriate spacing for the seeds based on an estimate of the plant's final size, measure the seeds' diameter and multiply by three to give a rough planting depth, then compare their decisions with seed packet instructions (if any). On site they watch a demonstration of how

to plant and then do it themselves (see *Planting and transplanting* in *Horticultural Notes*). Finally they discuss and decide how to protect the seedlings when they appear. Follow up with a race for the first shoots, the first true leaves, the first seedling to reach 5 cm, etc.



2. Planting and transplanting *This lesson dramatizes the whole process.*

Objectives Pupils understand the overall process of planting and transplanting.

Activities Some pupils represent seeds, some the sun, rain and wind, and some the gardeners. The teacher's desk is the "seedbed" and the rest of the room is the "open garden". Pupils walk through the whole process. "Seeds" are "sown" in the "seedbed" (pupils sit on the edge of the desk), then watered regularly by "gardeners" and protected from wind, rain and sun (standing near) by a canopy held by "gardeners". The seedlings come up ("seeds" all stand up), are seen to be overcrowded and are thinned out by gardeners. Gardeners continue to mulch and water, and "seeds" stretch and expand. Sun, rain and wind in turn come to help and hinder the seedlings. To get them used to sun, rain and wind, gardeners lift the canopy a little, then a little more, and a little more. When the "seeds" are strong enough, gardeners gently take them into the "open garden" and "plant" them back in their desks. As pupils carry out the real processes in the garden, the story is recapitulated, and can later be dramatized or contribute to a project on growing up. Older pupils draw up growing schedules for particular crops.



3. Mulching *Economical and effective, mulching is an essential tool of organic gardening.*

Objectives Pupils recognize the value of mulching, and know how to mulch and when.

Activities Pupils recall what plants like. They observe some plants which are wilting, diseased or overgrown with weeds, label them with their problems (e.g. *no water, competition, poor soil*) and suggest how to help them. The teacher proposes mulching (the "soil blanket") and explains what to do. Pupils sort "good mulch" (if possible, light-coloured straw) from

"bad mulch" (with weed seeds), then build up mulch round the plant victims until it is about 6 cm thick. They discuss how mulching helps with each problem (see *Mulching in Horticultural Notes*). As follow-up, pupils give demonstrations of mulching to visitors, families and other pupils (advertise them as "Mulch Magic"), make a routine of collecting and using mulching materials, or practise a mulching chant to a marching tune. Older pupils experiment by developing garden patches with and without mulch and doing weed counts. (Suggested by Guy *et al.*, 1996.)

4. Watering (1) *Watering (1) and Watering (2) should be consecutive lessons.*

Objectives Pupils appreciate plants' water needs.

Activities Pupils recall what plants like, and focus on water. They discuss whether plants can have too much water or too little (plants are like people – they can both drown and die of thirst). They speculate on the questions: *Where is there water/moisture in the garden? Where do plants get water from? Where is the water in plants? How does water get into the plant?* and then go to the garden to hunt for answers in leaves, stems, fruit, roots and soil. Feedback will reveal that moisture is mostly in the soil and in plant stems, and gets into the plants through roots (not leaves). Pupils guess how much of a plant is water (about 90 percent) and test this by weighing a bottle stuffed with grass, drying the grass for a week, then putting it back in the bottle and weighing it again.





8. How do we grow things?



5. Watering (2) *There are seven golden rules for good watering.*

Objective Pupils know when and how to water plants.

Activities Pupils recall how important water is for plants. They read out the Seven Golden Rules (see below) one by one and explain them, then try to recite them from memory. The class goes round the garden together, feeling the earth and assessing the need for water with a measuring stick (3 cm of dry soil needs water). Where water is needed, they suggest what to do and take turns at each watering task. As follow-up, pupils make themselves "moisture measures" and

show others how to use them. Older students experiment with over-watering and under-watering parallel rows of plants and recording health and growth over two weeks.

Golden rules for good watering (see *Watering plants* in *Horticultural Notes*)

- Measure moisture each day.
- Water in the evening or morning.
- Water soil, not plants. Get the water to the roots.
- Be gentle.
- Don't over-water or flood.
- Deep roots don't need more water.
- Mulch mulch mulch!

6. Weeding *The spirit of battle is good – but not all weeds are harmful.*

Objectives Pupils recognize common local weeds and their characteristics and learn how to control them easily, cheaply and ecologically.

Activities Groups each take one of the questions below and search the garden for the answer. They report back, bringing weed samples to illustrate their answers. Older students discuss the survival strategies of sample weeds (e.g. many seeds, deep roots, height, fast life-cycle). Pupils should recognize that weeds can be useful as well as harmful. The class discusses strategies for dealing with weeds (see *Weeds* in *Horticultural Notes*) and establishes a weeding routine. Relieve the boredom of weeding with weeding parties, competitions, a weeding policy, weed study, dramatizations of the battle and experiments with weeded and unweeded garden patches.



Questions

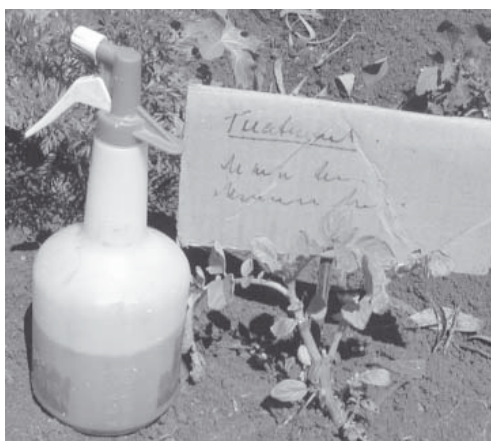
1. How many different kinds of weeds can you find in the garden? Do you know their names?
2. Which is the commonest weed? Do you know its name?
3. Where are the weeds growing? Are there any near the crops?
4. Where are the weeds growing thickest? Why?
5. Which is the biggest weed? How big is it? Where is it?
6. Which weed has the deepest root?
7. Are any of our crops in danger from weeds? Which?
8. Where are there no weeds? Why not?
9. Are there any insects on or around any of the weeds? Are any of the weeds sick?
10. Do any of the weeds have flowers or seeds? How do they spread themselves/propagate?



7. Keeping the garden healthy *A healthy plant can resist attacks by pests and diseases.*

Objectives Pupils practise healthy gardening as a basis for integrated pest management.

Activities Pupils revise previous learning by discussing the best ways to keep plants strong and healthy, writing up key words (e.g. good garden beds, rich soil, light and shade, compost, mulching, weeding, watering, beneficial insects, protection against predators). The class goes on a garden patrol with a *Plant Patrol Checklist* (see *Healthy plants in Horticultural Notes*) and reports back with observations and suggestions for action. Follow up with regular weekly patrols, passing the responsibility from team to team.



8. Plant doctors *This introduces the idea of treatment for specific plant problems.*

Objectives Pupils make a rough diagnosis of a plant problem, choose suitable remedial action, carry it out and monitor the effects.

Activities Pupils identify "sick plants" in the garden – those which appear to be suffering from pests, diseases or diet problems. They describe each case and give it a name (e.g. Lacy Leaves). Older pupils can try to identify the problem more precisely (see *Plant problems in Horticultural Notes*) and should recognize that one symptom (e.g. wilting) may mean several different things. If it is a pest, students look around for the culprit. They then discuss how to handle the problems.

With the teacher's guidance they pick up the basic messages (Disease: *Destroy*. Diet: *Feed*. Pest: *Pick, spray, trap, bring in the Pest Police*) and prepare to carry out immediate treatment. As follow-up, older pupils maintain case notes for their chosen plants and report on progress, or learn to make homemade plant sprays (see *Homemade sprays in Horticultural Notes*).

9. Harvesting *Harvesting is best learnt by hands-on demonstration and practice at harvest time. This lesson simply emphasizes principles and reinforces attitudes.*

Objectives Pupils know which food crops decay rapidly, appreciate the need for careful harvesting, rapid transport and good packaging, and know what to do with plant debris.

Activities Presented with some rotten and dried-up fruits/vegetables, pupils discuss why foods dry out (too much sun exposure, wind, thin skins), why they rot (bacteria/fungi), when they rot (cut, overripe, bruised, wet, warm) and which foods are "rapid rotters" (those which are ripe, soft and full of water). They hear a role-played interview with a tomato farmer and pick out all his mistakes (harvesting in the heat, collecting cut, bruised, overripe and damaged tomatoes, throwing them into the basket and leaving them in the sun). To follow up, they discuss dos and don'ts for harvesting their own crops, and make up a similar interview highlighting harvesting mistakes.



NOTES

[illegible]

PART 9: HOW WILL WE EAT OUR GARDEN FOOD?



Preparing, processing, promoting

Objectives

- Preparing and preserving garden foods
 - Preparing foods safely and cleanly
 - Preparing tasty meals using garden foods
 - Preserving vegetables and fruit
- Promoting foods and dishes successfully





9. How will we eat our garden food?



To be successful, a food-growing project should be thought through from beginning to end, "from plot to pot". For example, when you plant spinach, have in mind the final product – the spinach pie, or spinach salad, or spinach with scrambled egg. Think how it will be prepared, tasted and eaten, how pupils will learn about these foods, and how parents and families will be involved. Only make your final decision on what to grow once you have a good idea what will happen to it in the end.

From plot to pot

"Our research about vegetable eating shows that you ... ought to put kids in a garden, but also teach them about gardens and cook the food from the garden and have them taste it and see it's delicious. And then do it repeatedly. One cucumber is not enough."

(Michael Murphy, professor of Psychology, Harvard Medical School, in Orenstein, 2004)

A. WHAT WILL WE MAKE TO EAT?

Familiar dishes The dishes you have in mind must be appealing, fairly familiar and easy to prepare. If they require other ingredients (e.g. flour, eggs, seasonings), make sure these will be available when you are ready to prepare the food. Some



- beans with fresh vegetables (e.g. bean salad, maize and beans with tomatoes);
- baked or roasted fish with vegetables;
- vegetables with egg (e.g. omelette, fritters);
- stir-fried vegetables, or vegetable relish, with rice, maize or cassava;
- vegetable soups.

→ Think of some local examples.

Combinations Some foods should be combined with other foods in order for nutrients to be absorbed by the body. For example:

Vegetable foods containing vitamin A (e.g. green leafy vegetables, carrots, sweet potato)	<i>should be eaten with</i>	foods which contain some oil or fat (e.g. butter, ghee, groundnuts, nuts, oilseeds, avocado pears, vegetable oil, red palm oil).
Vegetable foods containing iron (e.g. green leafy vegetables, legumes, pulses, nuts)	<i>should be eaten with</i>	foods rich in vitamin C (e.g. citrus, mangoes, papaya, cabbage, guava, pineapple, tomato).

Some popular combinations are:

- green leafy vegetables with groundnut paste, or coconut milk, or oil and a little lemon juice;
- yellow/orange sweet potatoes with groundnuts or oil;
- dark green leafy vegetables with tomatoes and onion and a little oil;
- with every meal, a piece of fruit or a glass of water with freshly squeezed lemon juice.

→ Think of dishes in your own community with these combinations.

**Snacks** Think of:

- filling snacks (like roast maize, sweet potato);
- high-vitamin snacks (like carrots, pumpkin, mango);
- snacks which are fun to make (like popcorn and beansprouts);
- drinks (fruit drinks, herb teas, bean milk).

(See *Snacks and drinks from the garden* in the *Horticultural Notes*.)

➔ What are popular and nutritious snacks in your area?

Mealtimes If children don't normally have a proper breakfast before school, try to provide one so that they will have energy for the school day. Or provide a snack mid-morning, when children's blood sugar is getting low. It's often easier to get children to eat new snacks than to eat new meals.

➔ Can the garden help to provide children with snacks or breakfast?

On all these points, consult the school meals service, the local health authority, home economics teachers, the children, the parents and your own common sense.



B. HOW WILL WE PREPARE THE FOODS? WHO WILL PREPARE THEM?

There are four watchwords in food preparation: *nutritious, delicious, safe* and *economical*. Foods should be prepared so that they don't lose their food value. They should taste good and look good so that everyone wants to try them. They should be hygienically prepared so that they don't make us sick. And it should all cost as little as possible. Here are some roads to perfect preparation.

Good food value To get best value from our foods, some tips are:

- Don't overcook – cook as lightly as possible.
- Go for steaming rather than boiling.
- Cook "conservatively", using very little water.
- If you boil vegetables, use the water for soup.
- Make dishes like soups and stews where the cooking water is part of the dish.
- Put fruit and vegetable peels on the compost heap.



Steaming vegetables is better than boiling them

See the lesson outline *Preparing food* at the end of this chapter.

Great taste Fresh, organically grown fruit and vegetables already have a good taste. Many can be eaten raw – for example, carrots, peppers, peas, salad, young spinach, tomatoes. A little oil and salt brings out the flavour and also the food value. But sometimes cooking can enhance the flavour and so can good food combinations. Set children the goal of finding new food combinations that they like. Remember that appearance enhances taste. Get children to think how to make dishes look good.



Food safety Generally, the rule is that food preparation must be supervised by people who have training in food handling and food hygiene. The education authority may have Environmental Health Officers responsible for advising on food hygiene and sanitation on school premises. If you want to have practical cooking lessons, get their advice, or consult Home Economics teachers and school cooks, and give children some training in food hygiene (see the lesson outline *Food Hygiene* at the end of



9. How will we eat our garden food?



this chapter). This will include teaching how to deal with leftover foods safely. Make sure there is access to clean water for washing foods, and soap for washing hands, dishes and work surfaces. Alternatively, you may want to give demonstrations and let children try out the dishes at home.

Economical cooking You can create an outdoor cooking area quite cheaply using a fuel-saving cooker. Pressure cookers are expensive to buy but cook very quickly, use very little fuel and can cook almost anything, even cakes and bread. Earth ovens or “cob ovens” are excellent for roasting and baking. They are a lot of work to make but cost very little in materials. Solar cookers are easy and cheap to make and can cook anything, but need constant attention. Hayboxes or “wonderbaskets” (featured in the lesson outline *Cooking in the garden* below) are good for long, slow

cooking. They need no attention and are cheap and easy to make. All are highly educational, environmentally friendly and great fun for children.

➔ *How will you make your food preparation nutritious, delicious, safe and economical?*

C. HOW WILL WE DISTRIBUTE THE FOODS?

This will depend on your circumstances and aims. These are some of the things schools do:

- Distribute raw food (e.g. children collect fruit from trees and take it home), with a demonstration or advice on how to prepare the food.
- Prepare meals or snacks in school – e.g. breakfast to improve study, mid-morning snacks to raise energy, fruit and vegetables to add to lunch.
- Make small quantities of preserves and send samples home with children.
- Give vegetables, legumes, eggs and fruit to the school kitchen to add to staple foods (rice, cassava, maize) in school meals.
- Set up a school store/tuckshop/snack stall run by children or volunteers.
- Sell food at half price to families at break or after school.
- Distribute surplus food to needy local families or orphanages.



If you are feeding a large number of children, get them to bring their own lunch containers or plates so as to conserve water and reduce labour and time for washing up.

➔ *How will you distribute the foods you grow?*

D. DO WE WANT TO STORE, PRESERVE OR PROCESS THE FOODS?

Schools should think of doing just a little preserving and storing of garden crops. It is the traditional answer to seasonal lacks and to losing food stocks after the harvest to insect pests, rodents or decay. Children love dried fruits, which are rich in nutrients. Many dried products can also find a market. It catches the interest of families if children come home with samples of useful, tasty preserved foods – for example, a small bottle of tomatoes or fruit juice, a packet of mango slices or dried leaves for soups. Busy home cooks may be inspired to imitate the practice.

Moreover, preserving food is highly educational. It not only shows how to protect food against bacteria, mould, insects and rodents in a practical way, but also illustrates the scientific principles behind these processes.



Some methods of preserving fruit and vegetables are set out in the box below:

Preserving fruit and vegetables

Curing (e.g. onion, sweet potato, pumpkin, yam). Some vegetables will last longer if they are laid out in an airy shady place for a few days after harvesting. This thickens the skins and protects the soft vegetable inside.

Simple drying and storing (e.g. beans, peas, pumpkin seeds, sunflower seeds, grains). Legumes and oilseeds are dried on the plant or on racks, then stored in a cool dry protected place.

Shade drying or solar drying Fruit (mango, banana, guava) and vegetables (okra, tomato, green leafy vegetables) are dried in strips or slices in the shade or in a solar drier (a frame with a sheet plastic cover). Some fruits are "blanched" first in steam or boiling water to improve shelf-life, flavour and appearance. Some fruits (e.g. mango, pumpkin) are cooked and pulped, then dried to make a "fruit leather".

Making flour (e.g. pumpkin, banana, sweet potato, cowpea, breadfruit). The food is dried, then pounded and sieved.

Pickling (e.g. cucumber, cabbage). Many vegetables can be fermented, with salt or without, and then stored in salt water (brine), vinegar or oil.

Bottling (e.g. tomato pulp, fruit juice, whole fruit, jam). Food is cooked and bottled while hot, or bottled and then sterilized by boiling in the bottles. Sugar is generally added to fruit to conserve it.

Freezing (e.g. some fruits and vegetables, soups and stews).

If you are going to do some preserving, aim for a product that everyone will like and a simple process that will not fail! There are a few ideas for school projects in *Conserving and preserving garden food* in the *Horticultural Notes*. Find out what is traditionally done in your area. Some local techniques can be practised in school, or you may be able to improve local methods (e.g. using a solar drier instead of the sun). If the process is new to you, treat it as an experiment. When you are sure it works, send samples home and ask families to let you know what they think.

➔ *What foods will you store or preserve?*



Photo: FAO. "Rural processing and preserving techniques for fruits and vegetables", Food and Agriculture Organization of the United Nations (no date)

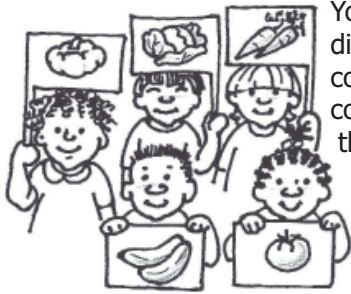
E. DO WE NEED TO PROMOTE THE FOODS?

1. What is people's idea of a good diet?

Often, the foods that children need for good health and growth are available but are not valued, and children don't eat them enough. Many nutritious local foods may not be given much importance in comparison with expensive foods, imported foods, or foods which "fill you up". In particular, people may see fruit and vegetables as the poor man's "hard-time food". In some places, fruits may fetch a good price in the market and are therefore sold to generate cash income rather than eaten at home.



9. How will we eat our garden food?



You need to have an idea of what your community thinks is a good diet. Their ideas will affect your project because you want to affect the community's thinking. Are there any special beliefs about food in the community? What do they think are "good foods" and why? What do they think a child should eat every day? When do they think children should eat, and how often? If food supplied for school meals is just cereals and beans, what do they think would be the best things to add? These questions can be discussed in class, through homework, or at parent-teacher association meetings (see the Nutrition Factsheet *A healthy diet for schoolchildren*). The school should explore these

questions in an open way, being careful not to antagonize people by telling them what they ought to think.

The discussion may reveal that everyone agrees on the best diet for children. On the other hand, you may find that children and their families need to be convinced about the value of some of the foods you would like to grow. Some foods may be held in low esteem. There may also be competition for children's interest by the street vendors who sell cakes, buns, potato chips and fried pies. Children are conservative in their tastes and like what they are used to. They may need to be encouraged to try new dishes and given frequent opportunities to taste new foods or food combinations. If this is the case, your project will need to *promote* foods as well as grow them.

Getting children to eat good food

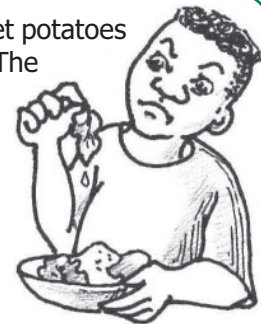
In a rural area of Africa, farmers grow beans, cassava, pumpkin and sweet potatoes but throw away the leaves (which are rich in vitamins and minerals). The school grew these plants, too, and gave the leaves to the cook for school meals. This was not a success at first because the children spent their lunchtime picking out the "green bits" and throwing them away! The school found three answers. (1) It gave some lessons about greens. (2) It invited parents to a workshop on "Green Leaves". (3) The cook mashed up the greens with beans (which the children loved).

* * *

In Latin America, some schools had a problem with children who rarely ate vegetables and did not think they were "real food". The school cooks tried many experiments. Stir-fried vegetables did not go down well, but "vegetable fried rice" was popular, and greens were stirred into the traditional chicken soup, which children were used to. (Miller, 2003)

* * *

On a fertile tropical island, local fruit is provided with every school meal. But many children will only eat imported fruits, mainly out of snobbery. In one school the teacher found the afternoon class rolling their oranges down the desks to the only boy who would eat them. The teacher brought in the local karate club to give a demonstration and talk about the club's diet. They gave local fruit a better name – and also started a fashion for drinking water instead of soft drinks.



2. How can we persuade children/families to value these foods and make them a habit?

- make them attractive;
- have frequent tasting sessions;
- involve children in promoting them;
- involve parents and the school meals service;



- create good publicity;
- call on role models.

There are some ideas for promoting foods in the TIPS box.

→ Which ones would suit your school, your community, and the foods you have in mind?

SUGGESTIONS FOR ACTION

- Think through the whole process “from plot to pot” and make a list of needs.
- Explore local methods for preserving and processing fruit and vegetables. Think about experimenting with storing and preserving crops.
- Discuss crop choices with parents, the Garden Group, the school meals service and the children. Ask for advice and support, and discuss ways of promoting the foods.

Outputs: List of familiar dishes and snacks which can be prepared with garden food
List of ideas for how food will be prepared/distributed/promoted.

TIPS FOR PROMOTING FOODS

Make the product attractive

- Make the food tasty.
- Have special sessions on the flavour, texture, colour and smell of the foods.
- Package the food attractively – e.g. wrap a roasted sweet potato in a washed green leaf, put a fruit drink in a bamboo mug, make plates of woven straw or stitched leaves.
- Create dramatic snacks such as popcorn, pumpkin seed sprouts and carrot “flowers”.
- Decorate the food and the table with garden leaves and flowers.
- Make a special ritual of snack time with garden foods.
- Call on role models (local sports heroes, popular teachers, well-known local people) to talk about how much they like the food and how they eat it.
- “Hide” the food if necessary in soups, stews or fritters.



Create good publicity

- Find a slogan, e.g. “Give us green vegetables every day”.
- Make a poster of the target dish to keep it in everyone’s mind.
- Make a little book about the food, with pictures, information and recipes.
- Label the growing plants with a picture and a little nutrition information.
- Make “garden food” a feature in school meals. Pin up the week’s menu with garden items highlighted, and praise the classes who produced them. Invent new names for garden dishes.
- Invite parents and helpers to special school lunches featuring garden produce.

Involve children and families

- Give children the final choice of what to plant.
- Get children to make a “mirror garden” at home, duplicating the school garden – same plants, same process, same timing, same products.
- Involve students in planning school menus to include garden produce.
- Explain the garden programme to parents/guardians, and ask for advice. Ask them to report the discussion to absent parents.
- Involve parents in cultivating the food, preparing it, serving it, distributing and promoting it.



9. How will we eat our garden food?



IN THE CLASSROOM

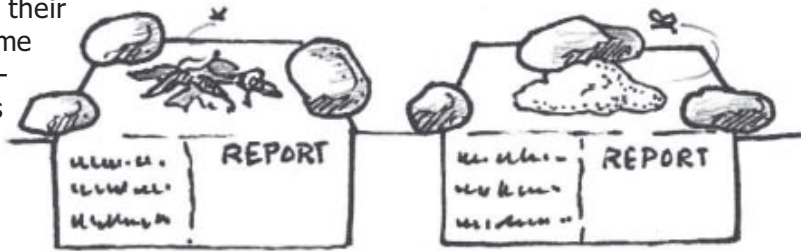
PREPARING FOOD In these lessons children learn about keeping and preserving food, food hygiene, and how to cook to conserve food value.

1. Keeping food Pupils experiment with the principles of food decay and food conservation.

Objectives Pupils share knowledge of how to keep foods fresh, recognize the causes of food decay and observe the process of decay.

Activities The pupils wash their hands. The teacher washes some freshly gathered fruit/vegetables in front of the pupils, cuts each in two, puts half aside and divides up the other half, giving everyone a piece to eat. This is the best way to eat

foods: freshly gathered, clean and eaten the same day. But what if we want to eat it the next day? Pupils suggest ways of keeping food fresh (e.g. cool, out of the sun, in closed containers, dry and in the dark). They contribute stories of what happens if fresh food is left (dries up, goes bad/mouldy, rots away, smells). The leftover pieces of food are used in a "Rot Race": pupils put each piece on a paper with a prediction of what will happen. They monitor the foods for a week, then observe and describe them in detail.



2. Food hygiene This lesson is best done in a kitchen, using real utensils.

Objectives Pupils recognize the danger of "invisible dirt" (bacteria) and how to avoid it, and start to practise hygiene routines in preparing food.

Activities Pupils look at a glass of muddy water and one of clear water and discuss which is clean and safe to drink.

The aim is to bring out that even clear water can contain "invisible dirt" (bacteria) which can make us sick. Pupils look around a kitchen (or a picture of one) to spot places where bacteria might be lurking (wherever there is damp, warmth and food). To beat bacteria, the slogan is "clean, cold, covered". The teacher demonstrates a hygiene routine for preparing and cooking a food (e.g. grated carrot), pausing frequently for pupils to suggest (and explain) the next move.

- Check that there is clean water and cleaning equipment (soap, scrubber, jug).
- Check that there are no insects around.
- Wash hands and nails with soap and running water.
- Set up equipment and check equipment and surfaces are clean.
- Wash foods in clean water. Prepare foods (rubbish on the compost). Cook if necessary.
- Cover cooked food and put in a cool place. When re-using, heat to boiling point.
- After eating, clear up and wash up.



Groups practise preparing other foods in the same way. To follow up they demonstrate the same seven steps at home.

3. Preparing food This lesson is about getting full food value. It should be done in a kitchen if possible.

Objectives Pupils describe local methods of preparing and cooking food, appreciate the value of raw foods, understand how to cook to conserve food value, and try out healthy cooking methods.

Activities Pupils wash their hands, then sample some raw and some cooked foods and describe

9. How will we eat our garden food?



the difference in taste. They name raw foods they like and say how they are prepared (grated, juiced, etc.). The teacher shows approval of raw foods and explains that they are usually very good for us. Cooked vegetables too should be crunchy, not overcooked. Pupils say what they can cook and describe how they prepare particular vegetables. For older pupils, the teacher demonstrates a number of cooking methods (boiling, steaming, grilling, stir-frying and a one-pot local dish); pupils discuss which method does most to *keep the food in the vegetables* (boiling is poor because many nutrients are thrown away with the water). To follow up, pupils experiment by comparing the water from steamed carrots and boiled carrots, spinach or squash (the colour shows how much of the nutrients are lost in boiling). They try out steaming, grilling or stir-frying at home and report back. (Carrot-water experiment from Kiefer and Kemple, 1998)



Steamed spinach

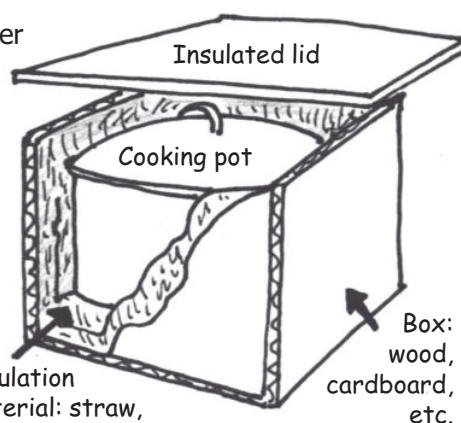


Boiled spinach

4. Cooking in the garden *This lesson is a social event which gives sharp focus to garden products.*

Objectives Pupils know the main local cooking fuels (older students compare costs), and can use one fuel-saving outdoor cooking method (older students can explain how it works).

(N.B. The haybox used in this lesson is a cooking pot with a lid which fits closely inside a large box or bag thickly lined with insulating material, e.g. hay, straw, banana leaves, polystyrene chips. The pot is heated to boiling, then put into the box/bag and left to cook in its own heat for several hours.)



Activities Students describe and sketch their home cookers and say what fuel they use; older students decide which are most expensive. The teacher demonstrates cooking with an open fire; pupils feel the heat and recognize that this means wasted fuel. The teacher then prepares a dish in the haybox and closes it up; again, the hands-on test shows pupils that this method traps the heat and uses it for cooking. Older students discuss how the heat is kept in (by insulation). The class fixes a time (several hours later) for a ceremonial opening of the haybox. To follow up, pupils give a haybox demonstration at the school for parents and visitors.



5. Conserving and preserving *Making preserves is interesting, educational and good publicity.*

Objectives Pupils understand some principles of food conservation, describe local food conservation practices, help with preserving foods and (older students) explain the processes.

Activities Pupils recall recent meals, tell which ingredients were fresh and which were preserved, then talk about examples of preserved/processed foods and preserving methods from their own experience. They look at sam-

ples of preserved/processed foods (see Part D above) and identify the process in each case. Older students discuss how these processes stop decay (e.g. by removing water, removing air, adding preservatives, heating to kill bacteria, hardening the skin, lowering the temperature). The best follow-up is a small-scale preserving project using garden food (for suggestions see *Conserving and preserving garden food* in *Horticultural Notes*).

NOTES

[illegible]

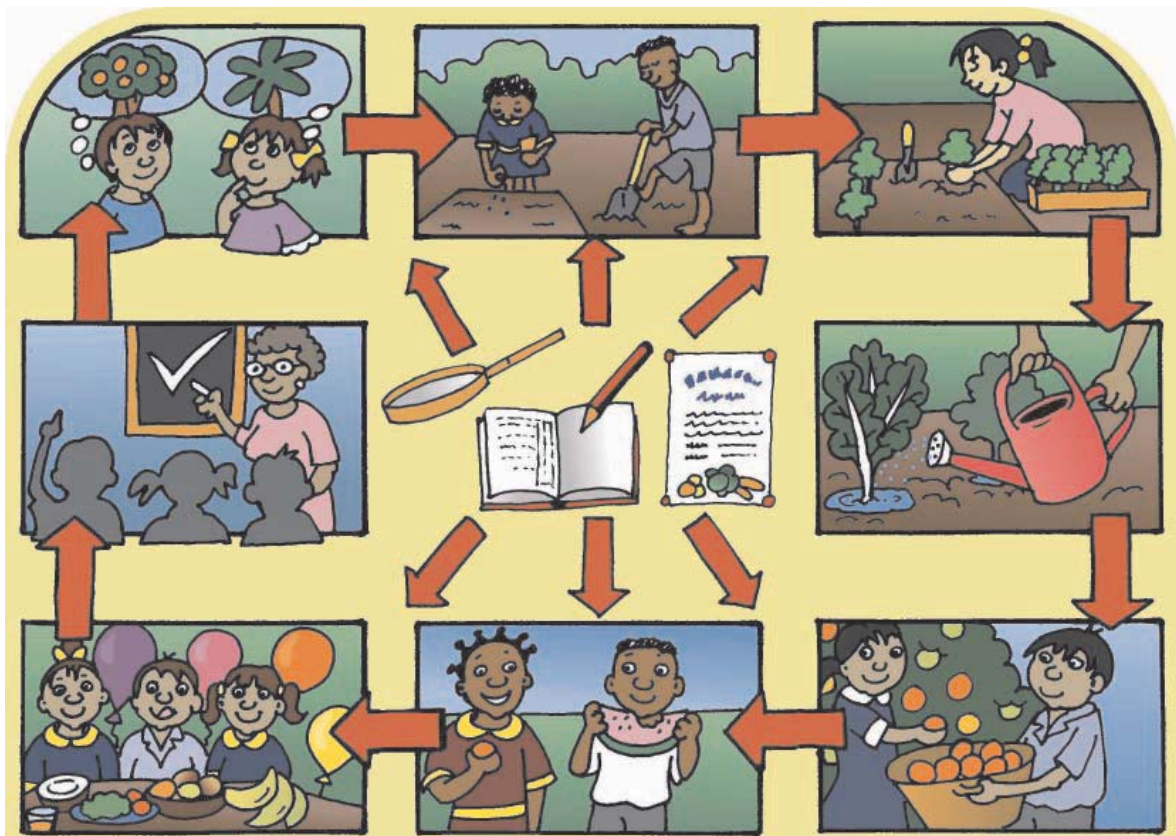
PART 10: WHAT'S THE PLAN?



Planning the project

Objectives

- Establishing identity
- Deciding objectives
- Monitoring and record-keeping
- Evaluating
- Publicizing
- Celebrating
- Deciding the time frame
- Making a summary and a visual plan





10. What's the plan?

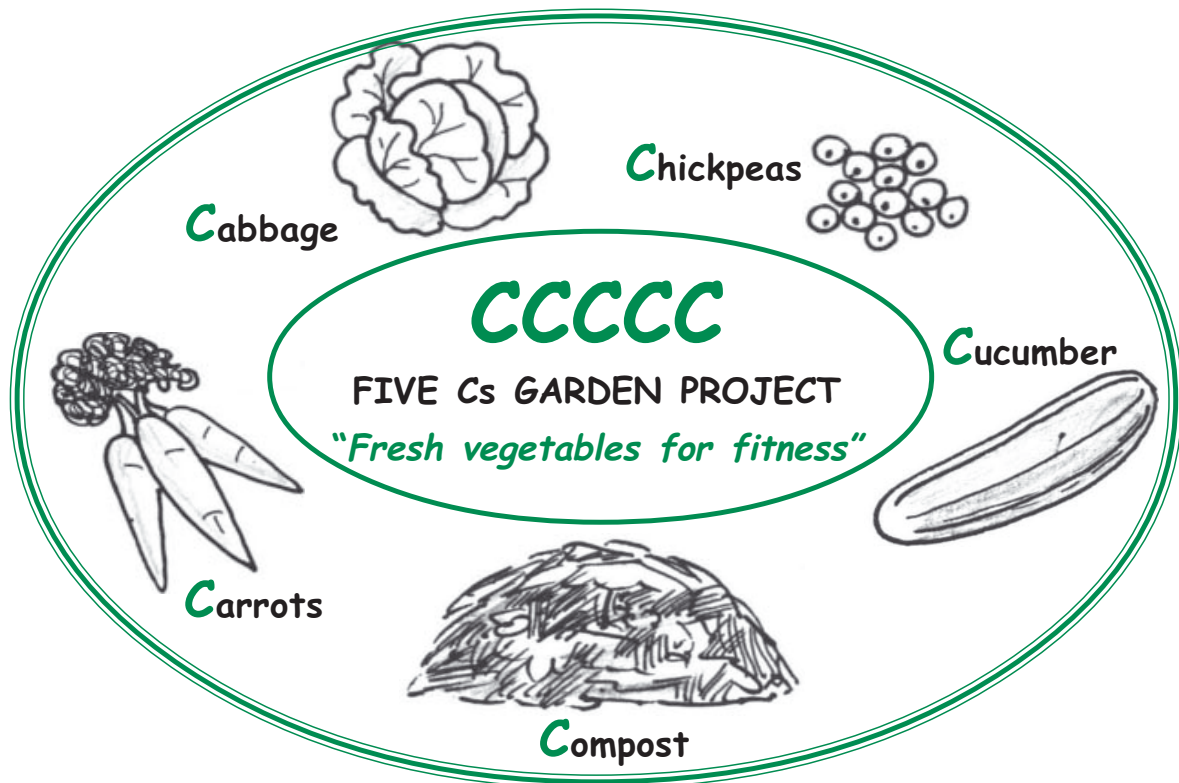
We have looked at many aspects of garden project planning. But there are some other questions we shouldn't neglect. In particular:

- What are we aiming at?
- How do we keep track of progress?
- How shall we decide what went well and how to improve things?
- How shall we celebrate?
- When will all the activities take place, and how long will it take?
- How shall we present the whole project?

But before thinking about any of these, establish your project's identity. Get students to find

- a snappy, memorable name for the project – e.g. "Green Leaves", "Carrots for Curly Hair", "Big Beans", "Vigorous Vegetables", "Five Cs Garden Project";
- a motto – e.g. "Four Fruits a Day", "Vegetables Keep You Healthy", "Fresh Vegetables for Fitness" (Banareng School, 2003);
- a logo or emblem – e.g. "CCCCC" for the Five Cs Garden Project.

Put these together into a poster – for example:



A. OBJECTIVES

Your project will reflect your general aims, practical and educational. Let's look first at the practical objectives.

1. Practical objectives

Being specific about what you hope to achieve is an exercise in realism and practical thinking. Ask yourself and your garden group these questions:

- What exactly do we want to produce, and how much?
- What are we growing it for? (i.e. how will the produce be used?)



- What else will we do to improve the garden generally in this period?
- How will we involve the whole school, family and community?
- What are our general plans for the future?

Record the answers as in the table below, so that they can be compared with what actually happens.

Older students can join in this exercise. They should be encouraged to estimate yields as well – e.g. the number of cabbages, the weight of carrots. Younger pupils can name the crops and foods that the project is aiming to grow, but they should not be expected to quantify them.

Objectives and targets for the Five C's project

	General aim	Specific targets (first year)
What will the garden produce in the first year?	Vegetables/fruits rich in vitamins and minerals.	1 bed of cabbages, 2 of carrots, 4 of cowpeas, 2 of cucumber and pumpkin. Some tomatoes, onions and green pepper for flavour. Mint for drinks and to keep away pests.
What are we growing it for?	To supplement school meals (maize and beans) with vegetable dishes and snacks.	One vegetable dish per week for all for 10 weeks, including cowpea leaves, pumpkin leaves, wild okra and amaranthus. Morning snacks/drinks (pumpkin, carrots, mint drink, cowpea milk, tomato juice).
What will we do to improve the garden?	Start hedges against goats, make compost	20 m of yuccas planted along the road. Compost heaps created for each class.
How shall we involve everyone?	Involve families and community in garden programme.	Three garden events: a) a ground-clearing session (with snacks), b) a tasting session for school meal dishes, c) a play about bad bugs and good bugs.
What do we plan for the next two years?	Plant fruit trees (papaya, passion fruit) and shade trees. Create more garden beds. Start a herb garden. Build an outdoor kitchen.	

Dishes in the Five Cs project

We are going to grow cowpeas, carrots, cabbages, cucumber and pumpkin, and gather wild okra and amaranthus. These are the dishes we are going to prepare.

Dishes <i>Cowpea curry</i> , with tomato, onion, carrot, pumpkin <i>Cowpeas with wild okra</i> , tomato and onion <i>Wild amaranthus relish</i> , with carrots and tomatoes <i>Braised cucumber</i> in oil, with onion <i>Cowpea leaf relish</i> , with tomato, onion and groundnuts <i>Cabbage soup</i> with carrot, onion, tomato <i>Baked cowpeas</i> with tomato, onion, pumpkin leaves and rice <i>Cucumber relish</i> with pumpkin leaves, groundnuts and tomato <i>Cabbage salad</i> – raw cabbage with grated carrot, onion, oil and salt	Snacks <i>Roast pumpkin</i> <i>Raw carrot & cucumber sticks</i>
	Drinks <i>Mint tea</i> <i>Fresh tomato juice</i> <i>Cowpea milk</i> (Zambian Ministry of Agriculture, Food and Fisheries, 2000)



10. What's the plan?

Bear in mind that a school garden is not like projects which stand or fall by whether they meet their production targets. It is a learning experience, so the process is as important as the product. Success is good for motivation, but small failures are interesting and instructive. Production objectives are not written in stone. Some may be dropped because of circumstances, or replaced with more interesting ones. Equally you may have to give up some gardening ambitions if educational needs are more important. Having a mid-term review of objectives and progress is always a good idea.

2. Educational objectives

Your educational objectives should have as much attention as your practical objectives – or more. Ask these questions:

- What will children learn to do (specific skills, actions, behaviour)?
- What specific information, concepts and attitudes will they learn –
 - about nutrition?
 - about business?
 - about the environment?
 - about other topics?
- What life skills will they learn? What particular attitudes and behaviour?



Here are some answers for the Five Cs garden project:

	General objectives <i>Children will learn:</i>	Specific targets (information, concepts, attitudes, skills and behaviour). <i>Children will learn:</i>
What will children learn to do to carry out the project?	To grow carrots, cabbages, cowpeas and cucumber successfully	Transplanting and thinning out; saving seed; watering properly; taking cuttings; planting; and staking (for the yucca hedge)
	To find and use wild okra and amaranthus for eating	Knowing how to find and prepare wild okra and amaranthus
	To use some organic methods	Making and using compost; the idea of crop rotation; integrated pest control; mulching
	To prepare and serve dishes, snacks and drinks	Steaming and braising; food hygiene; decorative snacks
	To preserve food	Drying and storing cowpeas; pickling cucumbers
What else will children learn? (nutrition, business, environment, other)	Nutritional value of some fruits and vegetables; food combinations	Value of carrots, cowpeas and cabbage To use oil/nuts with carrots, pumpkin, green leaves
	To appreciate and enjoy the dishes produced	To savour the flavour of raw carrot, cabbage and cucumber, enhanced by oil and salt
	The cost of dishes	To cost the additional inputs (e.g. groundnuts, oil, rice) and work out the cost per student per dish.
	Importance of maintaining and enriching the soil	The idea of soil nutrients and how they are used up and replaced; the value and practice of mulching
	Biology: plant parts	Roots, leaves, stems, fruit and seed



What life skills will they learn?	To manage oneself/ to collaborate/ to keep track of events/ to talk about what they do/ to act with adult partners/ to take action for own health and others'	To take responsibility for their own plots; to organize the work in a team; to keep a garden log with pictures; to keep parents informed/ to make gifts for helpers; to decide how to improve their own diet; to help with the hedge
--	---	--

Again, the watchword is flexibility. You can have only a rough idea of what will be learnt. Pupils do not have to "cover the syllabus". They may learn less than expected, or more, or (almost certainly) different. The result, at its best, is a dynamic and evolving individualized learning programme, partly led by the teacher, partly by the pupils and partly by the activities, the experience and the environment. The teacher's task is to keep an eye on what is happening, "go with the flow" and encourage whatever is valuable.

B. MONITORING AND RECORD-KEEPING

"Monitoring" is checking that you are doing what you intended. Every manager keeps track of progress in this way. For example, you might notice that a bed of plants is not doing well because it's full of weeds, that the Green Team has mended the fence very well so the chickens can't get through, that one fruit tree is producing much better than the others, or that the members of the Blue Team in the third class are no longer speaking to each other.

More formally, garden managers may be required to keep accounts, maintain a garden log or send in regular reports. Even if there are no such requirements, it is advisable to keep a garden diary in case other teachers have to take over, and for preparing reports or talks.



Keeping records is also important educationally for students. It builds up the habits of "taking stock" and "keeping track", which are key actions in successful enterprises. It helps them to observe closely, recall what they have done, see where they are going and look back afterwards; it reinforces learning and makes them aware of the significance of events. Finally, it produces something to show – to parents, visitors, pupils and the school in general.

Many developments can be monitored. For example:

- the growth of plants, weather, rainfall, etc.;
- the condition of compost;
- the state of the garden infrastructure (paths, hedges, irrigation systems, equipment, etc.);
- the presence of beneficial and harmful insects and their effects;
- the amount of fruit/vegetables produced (per plant, per square metre, per plot, over-all);
- the number and types of weeds;
- the work done and the time spent;
- money spent and received.



10. What's the plan?

At different ages, and in different ways, students can do all of these. Monitoring instruments may be:

- physical checks and measurements (e.g. rainfall, growth);
- counts (e.g. of weeds pulled, seedlings planted);
- diagrams (e.g. of project plans);
- graphs (e.g. of growth);
- calculations (e.g. of yields);
- drawings and photographs;
- work diaries or logs;
- reports, written or oral;
- cash books and accounts (see *Book-keeping and records*, Part 7, Lesson outline 7);
- checklists of work done.



A Garden Book or wall diary can be kept as a class project, with weekly entries and children's best homework pasted in; a Garden Journal kept by a group or individual can provide a basis for assessment (see the lesson outline *The Garden File* in Part 3). Some recording activities can be done in the garden, others for homework.

C. EVALUATING

Why evaluate? Evaluation leads into future planning (*What shall we do next time?*) and so completes the project cycle. It also has great psychological and educational value, especially since, in the learning perspective, failures and problems are as instructive as success. In the cycle of experiential learning, evaluation is part of the process of "reflection".



What do we evaluate? Evaluation looks back at the project in the light of its original practical and educational objectives (*What did we want to do? Did we do it? What did we hope to learn? Did we learn it?*). A further question, which should be asked more often,

is *Did we enjoy it?* However, by the end of the year people often do not have a clear picture of everything that has taken place. So the first question to ask in an evaluation is *What happened?* This may reveal outcomes that were not among the original objectives – some of them mistakes, but some worth recognizing as "retrospective objectives".

Who should evaluate? The evaluation is a shared responsibility. One of its purposes is to build ownership; everyone who is involved should therefore contribute – children, school staff, parents, helpers, cooks. All should know from the beginning what the objectives are, and should keep an eye on progress through the year. And no one person or group should ever be blamed if the outcomes are not as expected.

How should we evaluate? Evaluation can be done by discussions in class, through focus groups, in an open forum, through a comments box or questionnaire, through informal chats, or a combination of these. It does not usually matter if different groups do it at different times, but it is important to keep records of what they say. Generally small groups are best, with one member of the group making a note of what is said. It is often useful to have a focus group leader who is not directly part of the project – for example, a sympathetic education adviser or a teacher whom everyone respects. A suggested framework for discussion is given in the lesson outline *Evaluation*.



D. PUBLICIZING

Don't forget publicity! If you are doing something good, make it known (see Visibility Strategies, Part 2.C, and the lesson outline *Showing and telling* below). Think of who would like to know – local people, sponsors, institutions – and how they would like to be informed. Get children involved in telling them. A simple formula is:

- tell them what you are going to do;
- tell them that you are doing it; and then –
- tell them that you have done it.

Then invite them to the party!



E. CELEBRATION



Celebration is essential, both psychologically and socially. Try to end with some kind of jamboree, probably at harvest time. A celebration may be a food fair or harvest festival, a party, a religious service, a sale, a special meal, a performance or presentation, distribution of gift-wrapped produce, and so on (see the lesson outline *Celebrations*). Everyone who has contributed should be invited.

F. DECIDING THE TIME FRAME

What is your time frame – when does your garden season begin and end? What is the timing for each activity? Should crops be planted so they come to harvest at different times? How much time should we allow at the end for evaluation and celebration? We need to make some plans in advance.



If we are supplying foods from the garden:

- we need to know when to plant each particular variety;
- we must make sure they do not all crop at the same time;
- we have to get the timing right if the foods are for the hungry season.

Putting this information into visual form makes it easier to use as a planning tool, a point of reference, an aid to presentation, a way to remind people of objectives, or an appeal for help. Possibilities are a flow-diagram, a poster or a project calendar, with illustrations of the proposed activities and indicating all the participants.

G. PROJECT SUMMARY

Once all aspects of the project have been discussed, record the conclusions in a project summary. Work on this with older pupils, as well as with the garden group and colleagues. The questions are:

Aims

What are our general aims? What is our mission statement?

Project

What particular project are we going to do this year? What is its name?

Objectives/

What are our practical objectives and targets? What do we want to produce?

Targets

What are our learning objectives and targets? What do we want to learn?

Partners

Who will help and how?

How will family and community be involved (labour/expertise/contributions/visits)?

Who else will be involved, and how?



10. What's the plan?

Inputs	What inputs will be needed and where will they come from? (seeds, tools, etc.)
Activities	How much student and teacher time will be required? What will we do in the garden (both work and play)? Who will do it? What will we plant, how much and where?
Time frame	What events will there be in the garden programme? Who will be invited?
Monitoring	How are we going to schedule the activities?
Information	What will we monitor, and how? What records will we keep?
Publicity	How will the project keep people informed (especially parents, helpers, the head teacher, the LEA, the school)?
Evaluation	How will we publicize garden activities and create positive attitudes?
Celebration	When will we have the evaluation? Who will be involved? What form will it take?
	When will we celebrate, and how?



SUGGESTIONS FOR ACTION

- Use the garden's mission statement (see Part 3) to head up documents.
- Find a name, motto and logo/emblem for the project.
- Discuss and decide on "practical objectives" and "educational objectives".
- Simplify the main project objectives and publicize them in an attractive way – e.g. a poster on the notice board; a presentation by pupils to the Garden Group. Put the mission statement at the top.
- Make sure all participants know the main objectives. Ask them to remember them so they will be able to evaluate the project at the end. Remind them half way through the year.
- Discuss and decide what records should be kept of garden activities and who should keep them. If records are to be kept by pupils, plan to discuss them in garden lessons.
- Discuss and decide how evaluation will be done.
- Produce a short project summary (headed by the mission statement), put a copy in the garden file and give copies to the head teacher, the parent-teacher association, the local education authority, etc.



Outputs: Project name, motto and logo
Visual presentation of objectives and activities
Project summary

TIPS AND IDEAS

- Have a competition for the best name for the project.
- Get children to copy the main objectives (simplified) into their exercise books, take them home and explain them to their families.
- With older students, create the visual project plan together, discussing what actions will be required and putting them into a large-scale flow-diagram, calendar or poster.
- Put each part of the project plan on a separate sheet of paper and have it illustrated by a separate group of pupils. String the parts together into a flow-diagram with arrows made of paper or sticks and fix it on the wall.



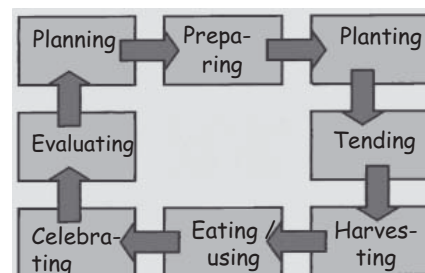
IN THE CLASSROOM

OVERVIEW These four lessons should be distributed through the school year: The *project plan* is drawn up when the project begins; publicity work (*Showing and telling*) can be done at any time in the project; *Evaluation* and *Celebrations* belong to the final stages.

1. Project plan should be done once the main decisions have been taken.

Objectives Pupils become aware of their expectations; older students create a summary of the project plan for presentation to the outside world. (N.B. The teacher should find someone who is prepared to receive, read and respond to the project summary produced in this lesson.)

Activities Pupils learn that Mr/Ms X wants to know about the garden project and has asked for information about it. This lesson is to prepare the summary. Pupils discuss a set of questions about the project (adapted from section G above) and record their answers. Older pupils work in groups on one section each, appoint a secretary and draft their response. The final version is read out for approval by the whole class. The information is delivered to Mr/Ms X, who should respond to it in writing or in person. To follow up, older students use the information to create a visual summary for display in the form of a flow-diagram, a publicity poster, a crop calendar or a workplan.



2. Showing and telling brings the school closer to the community, and children learn by talking.

Objectives Pupils appreciate the need to tell people about the garden and choose suitable content and channels for their messages. (N.B. The teacher should prepare the ground by finding out who in the school or community will respond positively to hearing from school pupils.)

Activities Pupils recount what has happened in the garden so far and discuss who would like to know about these things and why (e.g. parents and families, people in the school, garden helpers, the local media, other schools, the general public, local organizations). They stick up paper figures with names on them and discuss what they will tell them or show them (e.g. garden plants or products, the project plan, events, achievements, accounts, funny stories) – and how (see below).

Ways of showing and telling

Personal letters, greetings cards Book of garden stories Samples/free gifts Showing and telling at home Guided garden tours Invitation to the class	Circulars, newsletters Photos, drawings on display Posters, notices, fliers Talks/presentations Exhibitions, displays	Plays/dramatizations/shows Interviews on radio/TV Articles in local newspaper Bring and Buy sales Food tastings Parties
--	---	--



10. What's the plan?



3. Evaluation *helps to diagnose problems, plan for the future and involve the community.*

Objectives Pupils recall the year's gardening and reflect on it. They acknowledge others' help and congratulate themselves. (N.B. Teachers should ensure that all garden records are available and that all involved contribute to the evaluation and share their impressions.)

Activities Pupils recall the year's events and activities, triumphs and disasters, and express satisfaction or dis-

satisfaction. Older students recall the objectives and targets from the project plan, say how far these were achieved, why and why not, and spell out the lessons for the future. Pupils recall all those who have helped and discuss how to thank them. The class chooses the class's three top gardeners and awards them "Great Gardener" rosettes. Finally they award themselves a gardening prize (rosette, cup, shield), choosing between *Excellent*, *Very Good* and *Not Bad*, and finish with a self-congratulatory cheer. Follow-up consists of thank-you notes, cards or gifts.

4. Celebrations *There should always be a celebration, and children should help to organize it.*

Objectives Pupils are aware of the need for a celebration, think of who should participate and help to plan and organize the event.

Activities The teacher announces the celebration and gives date, place, time and the general nature of the event. The class thinks of a name for the event; lists the participants and decides how to invite them; plans the programme; discusses refreshments, gifts, decorations and displays; and organizes the work to be done. For follow-up, students organize their part in the event. Some kinds of celebration are a Food Fair, an Open Day, a harvest festival, a special meal, a party. Some ways to celebrate are competitions, decorations, demonstrations, displays/exhibitions, flags, gift-wrapped produce, guided tours, dramatic performances, presentations, posters, songs and dances, refreshments, special dishes and tasting sessions, storytelling, prize-giving.



PART 11: HOW DO WE GET GOING?



Organizing the work

Objectives

- Distributing the work through the school
- Organizing teams and groups
- Scheduling the work
- Establishing rules
- Dealing with security
- Covering the vacation





11. How do we get going?

How garden work is organized will depend on your aims, the school traditions, the age of the children, how many teachers and classes are involved, how much time you can set aside for garden work and your own preferences. Most schools with gardens reckon on each class putting in one to two hours a week, with pupils taking on occasional extra responsibilities for an extra half hour to an hour a week on a voluntary basis or in rotation. Most also organize some special sessions for major works such as ground clearing, when they invite volunteers and helpers from families and the community.

However it is done, make organizing work an opportunity for involving pupils, to develop their sense of responsibility, independence and capacity for collaboration and organization.

A. HOW DO WE ORGANIZE THE WORK?

Bear in mind that the school's role is to protect, respect and facilitate children's right to education. Children are in the garden to learn, not to provide cheap labour, and garden work must be seen as a learning experience. There are many ways of distributing garden work through the school, but they should be evaluated in this light. Here are some possibilities:

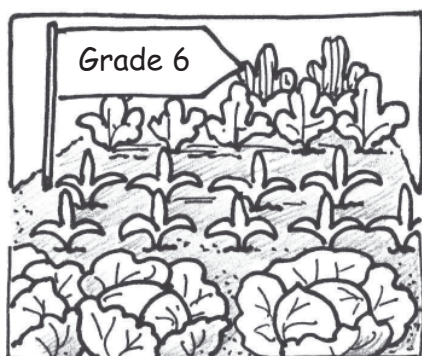


1. Everyone in the school cares for the whole garden

Classes rotate through different plots or through different tasks (e.g. Class 1 this week looks after the cabbages, or does all the watering). Garden records are kept for the project as a whole, with classes contributing according to their tasks.

This arrangement makes it easy to organize communal tasks (e.g. classes take turns to turn the compost) and means that all classes get experience of all the crops. It works best if there is a strong sense of communal responsibility. The disadvantages are:

- there are no personal or small-group responsibilities and therefore less scope for a sense of ownership and personal pride;
- there is not much variety of work for each child – and hence less to learn, and less interest;
- you can't run competitions between classes, groups or individuals;
- it needs whole-school coordination.



2. Each class has its own garden Each class works separately from the others, with some coordination to avoid overlap. The class can be divided into teams or groups which can work on their own beds and also contribute to communal tasks. A garden diary is kept for the whole class.

This arrangement can foster class pride. With separate class gardens, children can have easier or more difficult projects according to age. For example, a junior class can do simple flower pots while a senior class grow, bottle and sell fruit. This makes it possible to develop an increasingly complex garden curriculum through the school grades.

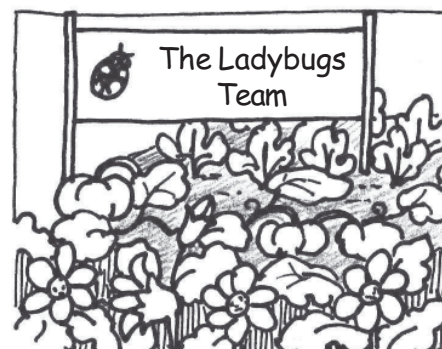
3. Groups/teams have their own plots Small groups of students have their own plots. They choose their own group names (e.g. the Blue Boys, the Green Fingers). A group may grow just one crop (easy to organize) or several different crops (more interesting and educational). Each group



keeps its own records – a file, diary, etc. Communal garden tasks are shared between the groups.

This arrangement has many advantages:

- It gives a sense of ownership and continuity.
- It encourages personal and group responsibility.
- It makes it easier to assess work.
- It makes control experiments possible.
- It is flexible – small groups can have small plots and larger groups can have bigger ones.
- It encourages emulation – most farmers learn from seeing what their neighbours do!



4. There are some individual plots If space permits, individual pupils or pairs of pupils can experiment with their own crops or methods. This opens up many possibilities. For example, give individual plots as rewards for good gardeners, selected by the teacher or the class. Or set aside a few small plots each year and get students to bid for them with well-developed proposals.

5. Assign managers and monitors Delegate some garden management to older pupils. A “garden team” of two boys and two girls can help to organize work and supervise activities. This role should be seen as an honour: special badges will help. Each month the team briefs a new team and hands over.

Individual students or small teams can specialize in particular communal responsibilities, with impressive titles such as Pump Engineer, Tool Manager, Security Team, Compost King. Pupils should be able to call on these “specialists” without always going to the teacher for information and advice. Such specialists can also take a hand in training their successors.



6. Create a School Garden Club Keen students can participate in a garden club, meeting once a week as an extracurricular activity. Parents and volunteers also belong, and can accompany younger children. The disadvantage is that your group may be small; the advantage is that they will be enthusiastic, and there will be plenty of sharing of experience.

Children as young as six or seven can carry out simple tasks such as collecting mulch, carrying weeds to the compost, and watering and

washing vegetables. But they should also have their own responsibilities to prepare them for bigger tasks when they are older. Give them small but complete projects – for example, looking after three flowerpots or two fruit bushes, growing a cabbage or six carrots alongside the main crops, picking and serving perfect papaya / pawpaws.

➔ Which of these would work well in your situation?



11. How do we get going?

B. TEAMS AND GROUPS

Teams or groups of five to seven pupils are convenient for organizing work. There are many ways of organizing teams, more or less flexible and more or less self-governing. For example:

<ul style="list-style-type: none"> • Each team has a team leader. • Teams and team leaders select themselves. • Team leaders are constant. • Teams are fixed throughout the season. • Teams have their own garden plots. • Teams choose their own names, colours, emblems. • Teachers brief team leaders, who brief their teams. • Adult volunteers work with teams as helpers and advisers. 	<ul style="list-style-type: none"> • Teams work without a leader. • Teams are selected by the teacher. • Team leaders are rotated through the group. • Teams change half way through the season. • Teams move round different garden plots. • Teams are given names by the teacher. • Teachers brief the whole class. • Teams work without the help of adults.
--	--

➔ Which of these would suit you and your students best?

C. SCHEDULING THE ACTIVITIES

Scheduled garden time may be used for trips, interviews, market research, taking produce for sale, cooking, demonstrations, parties, food fairs, showing visitors around. But in most regular garden sessions children will be doing:

- routine garden work (e.g. weeding and watering, pest control);
- communal tasks (e.g. tool maintenance, composting, fixing hedges);
- monitoring, recording, documenting (e.g. keeping accounts, measuring, writing journals)
- recreation, creative activities, socializing.

1. Routine garden work and communal tasks Try to get the garden to run itself.



Regular structure It will help to break up garden sessions into segments and have a regular structure – for example:

- a planning circle to start with (with a discovery question for the week);
- routine activities – gardening, making observations, writing diaries, etc.;
- a break for a game, song, snack, etc.;
- more routine activities;
- clearing up time;
- closing circle (discussing progress, congratulating each other).

(Adapted from Kiefer and Kemple, 1998)

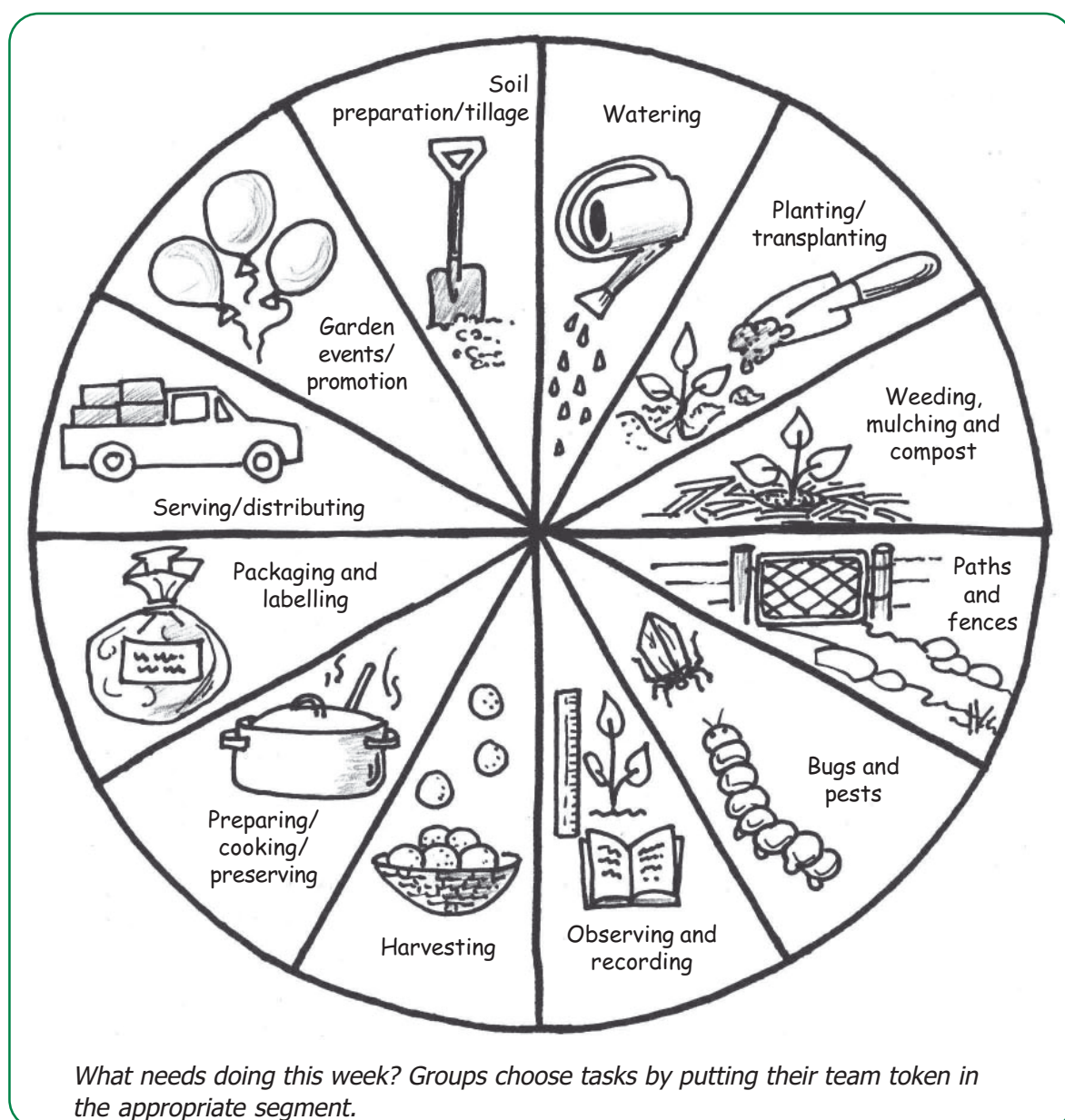
Once children have an idea of what to do, make a point of asking them what needs doing (rather than telling them) and encourage them to come up with suggestions themselves.



Rotating tasks If a task requires the teacher's presence, organize activities so each group can come to the teacher separately. For example, there could be 20-minute blocks on a) writing field journals, b) weeding/watering, c) working with the teacher on how to deal with mealy-bugs, with the blocks in a different order for each group. In the same way, if equipment or facilities have to be shared, organize them so that one group is working on something else while another is using the equipment.

Planning the week's work If the week's work needs to be scheduled, get children to do it. Display the regular garden tasks on a list or a wheel (see the box below) and discuss which ones are necessary this week, how many people are needed for each one, and how long it will take. Teams choose tasks, organize their own schedules and decide how to share the work. If work rotations can't be avoided, create them together so everyone understands them.

Garden Job Wheel





11. How do we get going?

Group work schedules Older students may use a proforma checklist, date it, tick off completed tasks and file it in the Garden File. Teams may draw up their own work schedule (see box below).

A team's work schedule

Three students, J, K and P, have their own small plot. They put in two half-hours a week in the garden with the whole class, a half-hour garden lesson in class, and another half-hour in their own time. This week they want to water their plot, measure growth, check for pests, and spray if necessary with their homemade spray.

Their communal contribution will be turning over the compost and helping to fix the fence. P and K plan to stay on Friday after school to water so that their plot doesn't dry out over the weekend. J, who lives near the school, is going to pass by on Saturday to see if his spraying has had any effect. He is also going to write up the week's report. In the Thursday class, the group will prepare a display of bugs and insects found in the garden.

This is the schedule they have drawn up for the week:

WEEK BEGINNING							
	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Gardening work	Watering K		Watering & spraying PJ		Watering & weeding PK		
Checking and recording	Measure growth J					Check for pests J	Write report J
Communal work	Turn compost P		Fix fence K				
Classwork				Insect display JKP			



2. Monitoring, recording, documenting

Children should inspect their crops every day – on the way to class, during breaks, or going home. Establish the habit early in the year by leading the whole class out for five minutes every morning until the pupils get the idea. Move on to independent inspections, with feedback reports to the class by groups or individuals. Younger pupils can observe and report orally; older students can collect measurements and data and can produce weekly reports to be kept in a portfolio or in their group's Garden File (see box on the next page). Keep the class interested by enquiring after the health of particular plants by name, and asking for suggestions.



If students wish they can specialize, and organize;

- a Pest Patrol (insects, worms, etc.);
- a Plant Health Patrol (growth and quality);
- a Plant Protection Patrol (soil moisture, weeds, mulch, fences).

A week's report

Week beginning	Jobs done
Progress	Problems
Other observations (Signed)

3. Recreation, creativity and socializing

Make garden sessions pleasurable and social. Have a break for a garden snack, a game, a story, a song, a puppet show, a short reading, a look at an interesting bug or plant, a sensory awareness activity, some artwork (e.g. pressing flowers and plants, making mosaics).

➔ What routines will suit your students and also get the work done?



D. RULES/GARDEN ETIQUETTE

Some "Garden Rules"

- Walk on the paths and not on the beds.
- Keep tools off the paths.
- Put away the tools.
- Clean tools before putting them away.
- Wash hands after gardening.
- Wash fruit or vegetables before eating.
- Ask before you pick anything.
- Place sharp edges or points of tools face down.



Garden rules are not laws to be enforced by garden police but a code of practice, a culture of good garden behaviour which everyone understands. But most practices need training and pupils need reminding before they become automatic. With this in mind, encourage children to make and maintain the rules themselves. For example:

- At the start, take pupils into the garden. Get *them* to demonstrate what to do, and to say why.
- Get older pupils to train younger ones, or team leaders to explain to their teams.
- Ask particular pupils to remind other pupils.



11. How do we get going?

- Let children take turns acting as garden monitors.
- Let new rules emerge and discuss them with pupils.
- Ask pupils if they can remember the rules or if it's necessary to write them up. This can put them on their best behaviour and will avoid long lists of Dos and Don'ts.
- If it does become necessary to write up rules, choose a positive wording which includes the children – e.g. *We walk on paths, and never on beds!* rather than *DON'T walk on the beds.*

➔ *What is your school's attitude to rules? What are children used to?*



Photo © Mel Futter

E. GARDEN SECURITY

Predators may be chickens, birds, goats, wild pigs, buffalo, elephants and monkeys – to name just a few. Or people! Discuss garden security with all and decide on what measures to take and when they will be needed (see *Protecting the garden* in the *Horticultural Notes*). Finding or creating the most effective scarecrow or bird scarer makes a good competition.

Creating a "restaurant" of vegetable scraps, old fruit, etc. can help to keep porcupines, buffalo, elephants and pigs away from the garden. In return, they will pay for their meals with valuable manure.

Also pay attention to the habits of other so-called "pests". Many fruit-eating birds actually prefer that which is over-ripe and beginning to ferment. Not only do they help to clean away waste fruit, but their droppings will produce new seedlings, as numerous types of fruit seeds (e.g. guava) need to first pass through the digestive system in order to germinate.



F. VACATIONS

If your garden projects start afresh at the beginning of each school year, you do not need to keep the garden going through the long school vacation. If not, discuss with students, parents, helpers and caretakers what maintenance is necessary over the holidays. Some precautions are:

- Weed well before going on holiday.
- Mulch plants well to keep them moist.
- Ask volunteer families to be "garden guardians", adopting the garden for a week each.
- Establish a roster of student "holiday teams" to come in twice a week during the vacation. Some school gardens make enough to pay students to do this, in cash or kind.
- Take security measures.



➔ *What measures can be taken to protect the garden? How can students and families help?*



SUGGESTIONS FOR ACTION

- Discuss and decide how garden work will be distributed, organized and scheduled.

Outputs: Plans for organizing, scheduling and documenting garden work

TIPS AND IDEAS

- Have a Garden Opening Ceremony:
 - Get a local celebrity to “open” the garden by planting the first plant.
 - Invite everyone, including the local press.
 - Provide some refreshment.
 - Display a picture or plan of the garden as it will be.
 - Outline the garden programme for the year.
- Young children can practise a rhythmic chant of garden rules – for example:
 - We walk on the paths and not on the beds.*
 - We share our tools and help each other.*
 - We keep tools off paths and sharp parts down.*
 - We clean our tools and put them away.*
 - We know what we’re doing; we garden well!*
 - We wash our hands and wash the food.*
 - And now we’re ready to eat!*



NOTES

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings on the page.

PART 12: HOW DO WE KEEP GOING?



Motivation and ownership

Objectives

- Motivating teachers, helpers and children
- Creating a sense of ownership





12. How do we keep going?

Views of gardening

Gardening is a pleasure for some people, but for others it is a reminder of a traumatic past.

(Payne, 1998)

In some places gardening is regarded as a worthwhile job and a fascinating pastime. In others it is seen as low-status manual work. Sometimes agricultural work may even be associated with colonialism or slavery. In some cases school gardening has acquired a bad name because children have been put to work as punishment or just to cultivate the teacher's maize plot.

However, most parents and caregivers appreciate the value of school gardening on a practical level. They can see that children gain practical skills, knowledge and life skills which will help them to look after themselves and their families in the future. Schools are also recognizing that children involved in school gardening actually learn better in *all* subjects.



When gardening is not seen as a chore, it is deeply motivating in itself. Garden lovers are never tired of seeing the shoots come up, tasting the season's crops, experimenting with new plants and new methods, battling against pests and diseases. The best motivation is this sense of achievement. However, other motivations may be needed to fight prejudice, to draw students in to discovering the real pleasure of growing things, or just to keep going through the less exciting garden tasks.

If there is a negative attitude to gardening in the school or community, schools may have to work to *create* motivation. They can do this by showing the value of what they are doing and conveying their belief in it. If, on the other hand, there is enthusiasm at the outset, it may still be necessary to *maintain* motivation, since garden projects last a long time and involve some repetitive work.

These are some of the reasons why good garden managers keep motivation in mind.



A. MOTIVATION FOR ALL

Everyone needs motivating. Keep everyone interested with an annual programme of events to do with the garden. Publicise the programme with a poster or an illustrated calendar. For example:

- Have a groundbreaking ceremony or a garden "opening".
- Celebrate the main garden events (planting, harvesting) and have visits and Open Days.
- Celebrate special national and international days (see the box on the next page).
- Get students to create posters about foods, crops, garden projects, insects, compost, etc. and to make poster presentations to their own classes, other classes and visitors.
- Have a Carrot Day or a Cabbage Day (or Pumpkin Day or Bean Day) when the crops are at their peak (see the box on the next page).
- Provide refreshments for all events. In working sessions make a break for a snack and a chat. Ask helpers to bring some food or drink to share, and grow something in the garden for snacks. Take the lead in showing children how to present and serve food agreeably.





Special days	Ideas for Carrot Day
<ul style="list-style-type: none"> • World Water Day – 22 March • World Health Day – 7 April • World Environment Day – 5 June • International Day against Child Labour – 12 June • World Day against Desertification and Drought - 17 June • World Habitat Day – 5 October • World Food Day – 16 October 	<ul style="list-style-type: none"> • Each class prepares carrots to be eaten in a different way. • Have a competition for the best carrot dish, the finest carrot, the best picture of carrots. • All participants take a bunch of carrots home. • Have a talk on the nutritional value of carrots. • Create a song about carrots and a carrot dance. • Present a dramatization of how the carrots were planted, tended, protected and harvested.  <p>(C. Ssekyewa, personal communication, 2003)</p>

B. MOTIVATION FOR TEACHERS AND GARDEN MANAGERS

What motivates teachers, school staff and garden managers? For them the garden may be any or all of these things:

- a special responsibility with appropriate compensation in time or pay;
- a source of pride and commendation from head teachers and local education authorities;
- something they can put on their CVs/résumés;
- a way of bringing new life to lessons;
- a way to gain skills and qualifications in gardening, nutrition education, etc.;
- a way of bringing the whole school together in a common interest;
- a way of enjoying fresh healthy food.

Make sure that some of these are true in your school. For example:

- talk to the education authority about certificated training courses in gardening, garden management, nutrition and project work;
- organize informal training using local garden experts (they will be flattered to be asked);
- get in touch with other schools with gardens and try to get funds for a workshop on gardens;
- arrange a competition with other schools for the best lesson plan centring on the garden;
- adopt a theme (e.g. water, corn) and discuss how to integrate it across the curriculum.

Of course, you too need to feel appreciated. Make sure your garden group and your head teacher know what is going on. If your garden is a credit to the school, the local education authority will come to visit, and will bring other visitors. Your fame will grow: you may even have to cope with envy! If there are press mentions and public appearances, share out the glory (everybody wants some) but take a little for yourself. You deserve it!





C. MOTIVATION FOR HELPERS, PARENTS AND SPONSORS

Cultivating people is as important as cultivating plants. Supportive parents and helpers can make all the difference. Here are some ways to catch and keep their interest.

Involve them Get them involved in discussing and planning the garden project, so that they are personally committed to its success. Present the garden plan at the beginning of the year and get their suggestions. Then ask them to explain the project to others: people are rapidly convinced if they have to convince someone else!

Give them choices Volunteers have different motivations and talents. Discuss what tasks need doing, but let them choose for themselves.



Get donations Ask for and accept donations of plants and seeds. Show donors how they will be helping. If possible, show them the garden, or at least a picture. Introduce them to children who can talk about what they are doing. Delegate individual students to keep track of donated seeds and cuttings and report back to the donor. Get parents to contribute small things (e.g. vegetable peelings for compost, seeds from gardens). Frequency and regularity matter more than quantity or value.

Keep in touch Invite families and friends of the garden to garden events. Keep them informed about what is going on. The cheapest and most effective way is word of mouth. Ask each person you see to talk to two others. Consult people frequently and ask their advice – and if you take it, let them know!

Say thanks Acknowledge all contributions and advice warmly. All who help and show interest should be thanked individually. Some ways of showing appreciation are:

- including names on a Roll of Honour (*These people helped with our garden...*);
- personal guided tours by pupils (practise them in the garden beforehand);
- small gifts of garden produce, nicely packaged;
- plaques commemorating important gifts (see *Signs and labels*, Part 5, C.4);
- notices in the school newsletter or the local newspaper, naming names;
- thank-you letters written by children (see *Showing and telling*, Part 10, Lesson outline 2);
- personal invitations to garden celebrations and events;
- genuine personal appreciation, warmly expressed both in private and in public.



D. MOTIVATION FOR THE CHILDREN



For the children, the garden should be a place with many positive associations where they can:

- produce something to be proud of;
- learn how to do things and take pride in their skills;
- show others what they have done and talk about it;
- get something nice to eat;
- make their own observations and talk about them;



- have fun with earth and water, play games and relax;
- get some pleasant exercise and mix with other children.

A lot can be done to create and maintain these motivations. Here are some possibilities:

Create values

- Show that you think that gardening and growing your own food are important and worthwhile.
- Make garden work a reward. For example, the class which presents the best garden project should carry out the project. Give individuals small personal plots as rewards for good work.
- Make the school garden an attractive place to be. DON'T let it be punitive.
- Let children identify imaginatively with plants and garden creatures through role-play, stories and drama.
- Give children a material stake in the garden – for example, part of the harvest, a share of the profits, payment for looking after the garden during the vacation.
- Reserve some garden projects for older students only, so that these activities are associated with growing up and becoming more important in life.



Create variety

- Treat each year's work as a separate project, and change it from year to year.
- Plan interesting events to take place in the growing period, when routine work gets boring.
- Plant for beauty and interest as well as for utility.

Highlight stages and events

- Divide the project visibly into short stages. Tick each one off as it is accomplished.
- Frequently look back to the aims of the project and forward to the outcomes.
- Make a big fuss over "first fruits". Put them on display, photograph them, taste them together.
- Mark outcomes in ceremonial form (harvest festival, garden exhibit), with contributions from pupils. Keep pupils aware that these events are approaching and discuss their contributions.



Encourage children to promote the garden themselves

- Get children to label and signpost the garden.
- Encourage children to tell families and friends about plans and activities.
- Have pupils explain their plots to visitors. Train them to act as "garden guides" and give them a badge when they qualify.



12. How do we keep going?



Reward success

- Give rewards for individuals and groups – personal praise, public commendations, prizes, gold stars, good marks. Give a school mark for practical work in the garden and another for garden files, diaries or drawings produced by individuals or teams.
- Have a garden credit scheme. Children earn credits for garden work through the year, with a certificate at the end.
- Encourage pupils to congratulate each other, and older pupils to help and praise younger ones.
- Have competitions and prizes – for example for the first edible carrot, the biggest yield, the healthiest-looking green leaves, the

most pest-free plants, the best-kept plot, the most attractive flowers, and a booby prize for the biggest weeds. Children can decide who should have the prizes and organize the prize-giving.

Garden competition

The 4H Club organized a competition in the Caribbean for the best meal or snack invented by a child from garden produce. One winning entry was a kallaloo drink with a touch of ginger.

(C. Power, personal communication, 2003)

E. A SENSE OF OWNERSHIP

One of the most powerful motivations is the sense of ownership. This is also an important condition for developing life skills.

Having responsibility (Motto: "Our garden, my patch")

Children should:

- see the garden as theirs, and see that adults respect this feeling;
- have access to their plots at all times;
- have both personal and communal responsibilities (e.g. *my plant, our turn to water*);
- help to protect the garden against predators and thieves.



Making decisions and taking initiatives (Motto: "Our plan, my idea"). Adults and teachers will have to make some of the main decisions, but pupils must also be able to make real choices and decisions, both individually and in groups/classes. Help them with their choices: for example, make sure they have enough information, give them a viable selection to choose from, encourage discussion of the pros and cons.



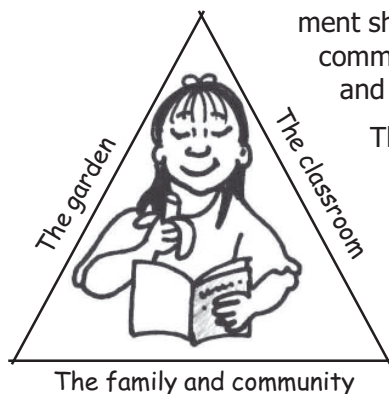
Sharing knowledge and skills (Motto: "Ask and tell"). Pupils should be encouraged to seek information and advice from others, and to pass on their own knowledge and skills to families, younger children, classmates. This socializes and reinforces learning.

Know what is going on (Motto: "Be in the picture"). Older pupils in particular can see a project as a whole from the beginning. This helps them to plan and organize, talk about the project and evaluate it. Where actions can't be undertaken by pupils alone (e.g. installing a water supply), they should be informed, consulted, and given the opportunity to observe and document events.



F. A FINAL WORD

Children's health is the concern of the whole school and community. The classroom curriculum, extra-curricular activities, the school establishment and the school environment should reinforce each other and work together with the family and community to ensure that children have their basic rights to education and to adequate nutrition.



The School Garden Guide works on all these fronts – growing food in the garden, learning about it in the classroom, involving the school meals service, and bringing in the family and community to support the programme. This multi-faceted approach is the best way to successful education for better nutrition and long-term health. More than that, it may play a part in promoting not only the children's health but also the health of their families and of the natural environment.

This Manual is not long enough to deal with everyone's needs and circumstances. We hope, however, that you have enough practical information here to start thinking and planning, a variety of ideas to suit your circumstances, and enough inspiration and good examples to carry you ahead. We also hope that you will adopt some of the watchwords of this Manual.

We would like to congratulate you on getting this far, and wish you the best of luck with your garden project!



Photo courtesy of S. Paulick

Watchwords

Use school gardens <ul style="list-style-type: none"> • for learning • for interest • for good food • for pleasure 	Give your garden <ul style="list-style-type: none"> • water • protection • good soil • friendly insects
See people as <ul style="list-style-type: none"> • guides and experts • helpers • friends of the garden • willing listeners to children 	Help pupils to <ul style="list-style-type: none"> • learn, work, observe • eat well • grow up responsible and cooperative • respect the environment
SHOW THE WORLD WHAT YOUR GARDEN CAN DO!	



12. How do we keep going?



SUGGESTIONS FOR ACTION

- Pick a few ideas for building and maintaining motivation in all your players.
- Discuss questions of motivation with your garden group.
- Get ideas for a “garden programme” of events through the year.
- Include motivation (of all parties) as one element in the project evaluation.

Outputs: Garden programme

TIPS AND IDEAS

- Display the four mottoes and discuss them with pupils, teachers, parents and garden helpers.
- Discuss the garden programme with children and ask them to publicize it.



FOOD FACTSHEETS

Basic information about fifteen good food crops

Banana	129
Beans, Peas and their cousins	131
Cabbage and its cousins	133
Carrot	135
Dark green leaves	137
Kitchen herbs	139
Oil seeds	141
Okra	145
Onion	147
Papaya	149
Pineapple	153
Pumpkin	155
Sweet Potato	157
Tomato	159
Tropical Tree Fruit	161

NOTES

[illegible]

Food Factsheet: BANANA

(*Musa acuminata*)



Bananas are a good snack food for children. They can grow from suckers and are harvested all year round.

Names, varieties, relatives	What food is this? Are there different varieties? Bananas came first from the jungles of Southeast Asia. They grow in the tropical "Banana Belt" between 30° N and S latitude. There are two main types: the table banana and the plantain (cooking banana), and almost 1,000 varieties.
Nutritional value	Is it good for us? What is its nutritional value? Who is it good for? Bananas are very good for us. They provide a quick boost of energy and are a good source of vitamins C and B6.
Dishes, combos, snacks, preparation	How is it generally eaten? How else can it be eaten? How do we cook it? Eat bananas fresh for breakfast or a snack. Eat dried banana slices as a snack. To make banana juice, press a ripe banana through a wire strainer, then add some milk and a little clear honey. Mashed banana can also be part of a weaning diet for infants.
Easy to grow	How easy is it to grow here? Very easy to grow in the right place. Bananas like moderate rainfall and moderate warmth. They grow best in rich, well-drained soil.
Time frame	How long does it take to grow? When should it be planted and harvested? Bananas are grown and harvested all year round and are ready to be harvested 8 to 10 months after planting. They are more likely to fruit in warm weather.
Propagation/ planting instructions	How big is it? How much space does it need? Bananas grow up to 15 m high. Planting distances vary between 2 x 2 m and 5 x 5 m, depending on variety. Where should we plant it? How do we plant it? They are grown by planting suckers taken from the base of mother plants. Suckers are dried for about two days before planting.
Care/ cultivation	How do we look after it? Does it need staking/trellising? lots of water? shade? Their stems are not wood but rolled leaves and can blow down easily. Use props or windbreaks to protect against high winds.

	<p>What attacks it? And what do we do about it?</p> <p>The banana weevil, a black beetle, is one of the serious constraints to banana production. The larvae bore through the corm and the lower stem. Field sanitation is very important and the plants should be kept clean. Use borer-free planting materials and plant suckers very soon after you cut and treat them so that weevils cannot re-infest the suckers.</p>
Productivity	<p>How much will it produce?</p> <p>Each stalk produces one huge flower cluster/bunch and then dies. Each bunch is made up of many "hands" which in turn have a number of fruits. The whole bunch can have hundreds of fruits and weigh more than 50 kg.</p> <p>How long does it go on producing?</p> <p>It can produce fruits from 3 to 20 years on average. The main plant is cut away after harvesting, and the daughter becomes the main plant.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it?</p> <p>Bananas can be harvested when three-quarters of the fruit are full size. To ripen them, hang the bunch in an airy place.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How?</p> <p>Bananas are usually eaten fresh, but they can be kept for a long time in dried form.</p>
Other uses	<p>What else can we do with it?</p> <p>The big leaves are used as green umbrellas, plates, tablecloths, temporary mats, etc.</p>
Culture	<p>Some think that bananas were the first fruit on the earth. They are one of the most important tropical fruits, an important cash crop grown on large plantations for export, and an essential staple food for many developing countries.</p>

Food Factsheet: BEANS

and their cousins (*Phaseolus vulgaris*)

Beans and peas grow on vines or bushes. The main food parts are the seeds and the fleshy seedpods. They are easy to grow in the warm season or all year round in the tropics. Besides producing tasty food, beans and their cousins can improve garden soil.



Name, varieties, relatives	<p>What food is this? Are there different varieties?</p> <p>There are many kinds of very nutritious beans and peas. a) The vegetable types are picked when pods are still soft, for eating right away. These include peas, runner beans (French bean), cowpea, lablab, long bean, broad bean and sugarpeas. b) The grain or pulse types produce dry bean seeds for storing, including common bean, mung (green gram), urd (black gram), chickpea, lentil, pigeon pea (dahl) and blue pea. c) Many peas and beans with tasty and fleshy pods can be picked either hard or soft – for example, green pea, pigeon pea and runner bean.</p>
Nutritional value	<p>Is it good for us? What is its nutritional value? Who is it good for?</p> <p>Beans and peas are very good for us! They have body-building protein, great food energy, vitamins C and A, and iron.</p>
Dishes, combos, snacks, preparation	<p>How is it generally eaten? How else can it be eaten? How do we cook it?</p> <p>Eat vegetable beans in stir-fry, steamed or boiled. Young runner beans and peas are delicious raw, in salads or as a snack. Dried beans need to be soaked first to absorb water and then boiled until soft. They are perfect for curry, stew and soup (e.g. <i>dahl</i>, India; <i>feijoada</i>, Brazil). Eat boiled beans cold in salad, or mash them and fry with onion and chilli (<i>frijoles</i>, Mexico) or in a paste with grated coconut and chilli. Dried, roasted peas and beans are great snacks.</p> <p>Many beans have edible leaves which are excellent vegetables, particularly cowpea, winged bean, runner bean and pigeon pea. Steam leaves or stir fry with a little garlic and serve with any meal. Winged bean and runner bean also have edible tubers. Some beans like soybean and groundnut produce cooking oil. Green gram and other small beans are germinated and eaten as sprouts in salad or as a garnish.</p>
Easy to grow	<p>How easy is it to grow here?</p> <p>Beans will grow in practically any garden soil from sand to clay. They grow in warm places, except for broad beans, which grow in winter and spring in cool climates. Dry kinds such as gram and lentil need dry weather at harvest time.</p>
Time frame	<p>How long does it take to grow? When should it be planted and harvested?</p> <p>Two to six months to grow. Plant early in the warm season. Harvest <i>vegetable</i> bean pods in about 6-8 weeks, before the seed has fully formed. Harvest <i>dry</i> bean seeds when fully mature, just before pods begin to split open, 3-4 months after planting.</p>
Propagation/ planting instructions	<p>How big is it? How much space does it need?</p> <p>Bush types of beans and peas need about half a square metre each. Climbing beans like long bean and runner bean need a trellis about 2 m high.</p>

	<p>Where should we plant it? Plant in a well-drained, sunny place sheltered from wind. Mix compost and firewood ash into the bed before planting.</p> <p>How do we plant it? Does it need transplanting/thinning? Soak the seeds for an hour, then plant directly into beds. Plant bushy beans about 5-10 cm apart, in rows about 50 cm apart. Runner beans are planted 5 cm apart in a single row under a trellis. They usually germinate in 1-2 weeks. Failures are often caused by planting too deep, drying out, very hard compacted soil or over-watering.</p>
Care/ cultivation	<p>How should we look after it? Beans don't need much compost. They have special roots that collect nitrogen from the air, which other plants have to get from manure or compost. Weed around plants.</p> <p>Does it need staking? trellising? a lot of water? shade? For climbing beans put up a trellis about 1.5 m high when you plant. Water regularly in hot weather – at least once or twice a week.</p> <p>What attacks it? And what do we do about it? Diseases can build up in the soil from old plants. Do not plant beans in the same place next year. If you have infected plants, destroy them.</p>
Productivity	<p>How much will it produce? How long does it go on producing? Ten runner beans or long bean plants will produce 4-5 bunches of fresh bean pods – about a kilogram a week for 4-8 weeks.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? a) Vegetable types need to be harvested every second day to pick the succulent green pods before they get old and stringy. They store for only a week or two in a cool moist place. Don't put them into airtight bags as they will get warm and start to rot. b) Let the hard kinds dry off once the seeds in the pods are mature and hard. But make sure you harvest before pods shatter and seeds fall out. After harvesting, spread out the pods on a mat to dry in the sun so the bean seeds fall out of the pods. Winnow out the pods or remove them by hand. Sun-dry for a few days so they store well and to help get rid of pests. Turn them daily so they all dry, and remove damaged or diseased ones. Store in sacks, bins, urns or grain stores, and make sure rodents are kept out.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? Mature dry beans last for two years or more if they have been dried properly. But seed coats may harden in storage and make cooking more difficult. Some factories freeze fresh beans and peas.</p>
Other uses	<p>What else can we do with it? Beans or peas are an essential part of the crop rotation cycle. They put nitrogen back into the soil.</p>
Culture	<p>Beans provide essential protein and iron for vegetarian people and for those who do not eat much meat. In India and Mexico, beans are a daily staple food. In Asia green gram flour is made into special cakes for festivals. Many Indians would say pigeon pea <i>dahl</i> is their national dish. Soybean is made into a vegetable curd, <i>tofu</i>, or into a fermented cake, <i>tempeh</i>. Green gram and soybean are made into a kind of milk, a popular and nutritious drink.</p>

Food Factsheet: CABBAGE

and its cousins (*Brassica* species)

These vegetables are a common and nutritious food in many cool or warm countries. They are delicious too! They are quite hardy and cabbages can be stored for up to 2 months.

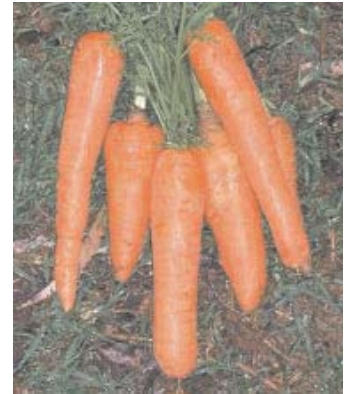


Names, varieties, relatives	What food is this? Are there different varieties? Head cabbage forms a tight head of leaves. Other vegetables in the cabbage family have tasty leaves and flowering stems including: mustard greens, broccoli, pak-choi.
Nutritional value	Is it good for us? What is its nutritional value? Who is it good for? It has vitamins A and C, and minerals we need each day. The kinds with green stems and leaves have the most vitamins. Raw vegetables have more vitamin C.
Dishes, combos, snacks, preparation	How is it generally eaten? How else can it be eaten? How do we cook it? Head cabbage is mostly eaten sliced and boiled, steamed or added to soups and stews. Leaves or flower buds of the others are cut into pieces and steamed, stir-fried or added to soup and curry. Eat all kinds of brassicas cut up as a salad, raw or lightly cooked to make them tender but crisp.
Easy to grow	How easy is it to grow here? Very easy to grow, but get a variety suited to your local climate. Cabbage and broccoli are for cooler places. Mustard greens and pak-choi grow in the tropics.
Time frame	How long does it take to grow? When should it be planted and harvested? Plant cabbage and broccoli after the summer heat and harvest 2-3 months later in winter and spring. Plant and harvest mustard greens all year round, but don't grow pak-choi in the hottest season. Start picking leaves after about 4 weeks.
Propagation/ planting instructions	How big is it? How much space does it need? It needs 30-50 cm square per plant. Where should we plant it? Plant in rich soil. It needs rain or watering, but is hardy to cold, sun and wind. How do we plant it? Does it need transplanting/thinning? It's easiest to buy the good seeds. Seeds of mustard greens can be saved from a plant left to flower in the garden. Cabbage, broccoli and pak-choi seeds can be sown into seed trays or a seedling bed. Transplant to garden beds in rows 30-50 cm apart when they have their first true leaves.

	Mustard greens and the others can also be sown directly into garden bed rows and thinned to 25 cm apart.
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade?</p> <p>Add animal manure or compost to the mulch. Water regularly, but don't swamp the soil! Without air the roots will rot and the plant will die.</p> <p>What attacks it? And what do we do about it?</p> <p>Snails, slugs and White Butterfly caterpillars will chew the seedlings, leaves and flower buds. Pick them off by hand, or dust plants with ash, or use a soap spray or an approved pesticide like Derris Dust (<i>rotenone</i>) or Pyrethrum. Don't forget to look <i>under</i> the leaves! Aphids can be controlled in the same way. Generally, avoid pests and diseases by using clean soil, keeping weeds down and mulching the soil so it doesn't get too hot. Remove badly infected plants to avoid spreading infection. And rotate crops! Don't plant any of the cabbage family in the same place next year.</p>
Productivity	<p>How much will it produce?</p> <p>A typical cabbage head is rounded, heavy and 40 cm across. Pak-choi grows a tight, solid cylinder of leaves and fleshy stems about 30 cm high and 10 cm wide. Broccoli can produce a tender main flower bud 15 cm across on a fleshy stem 15-20 cm long. After the first main bud, small side flower buds can be harvested. From 10-15 mustard greens will produce a meal of leaves every 3-4 days.</p> <p>How long does it go on producing?</p> <p>Cabbage and pak-choi are harvested once, but broccoli and mustard greens will go on producing a little more after the first cut for about a month.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it?</p> <p>Cut the stem of cabbage and pak-choi heads close to the ground and wash off dirt. Store cabbages covered with a sack in a cold place for up to 2 months. Cut the central stalk of broccoli when it is still tight and soft looking: it gets fibrous if the head starts to open. Cut the later side buds when they reach 2 cm across. Pak-choi and broccoli can be stored in a cool place for 7-10 days. Single mustard green leaves can be cut close the stem or the whole plant harvested at once. The leaves wilt after 2-3 days.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How?</p> <p>Cabbage and pak-choi can be fermented or pickled. To ferment, slice them up into a bowl or pot with a little water. Cover with a damp cloth and put a clean stone on top to squash the cabbage. It will soften and go sour, and can be kept for up to a month. Another way to preserve it is to pickle large pieces of leaves in vinegar and store in sterile jars (boil the jars in water to sterilize them first).</p>
Other uses	<p>What else can we do with it?</p> <p>Feed leftover stalks and leaves to animals or put them on the compost.</p>
Culture	<p>Fermented cabbage (sauerkraut) and pak-choi are popular traditional foods in northern and eastern Europe and eastern Asia. Ancient Romans liked cabbage; for ancient Egyptians, it was a sacred food.</p>

Food Factsheet: CARROT

(*Daucus carota*)



These vegetables are a common and nutritious food in most cool and some warm places. They are crisp, juicy and a little sweet, and can be stored for up to 2 months.

Names, varieties, relatives	<p>What food is this? Are there different varieties?</p> <p>Carrot grows a succulent orange or red root. Common varieties are Chantenay, Oxheart, Kuroda and Red. Carrot has a few tasty cousins: parsnip roots, celery stems, and the kitchen herbs parsley and coriander. Turnip and radish are root foods in the carrot family that have nutritious leaves as well as a root. All of these plants are grown in a similar way.</p>
Nutritional value	<p>Is it good for us? What is its nutritional value? Who is it good for?</p> <p>Carrots are one of the most health-giving vegetables. They have vitamin A and other vitamins and minerals, and they are important for good eyesight, skin, hair and brain development. They are also high in sugar. Eat a carrot every day to do well at school!</p>
Dishes, combos, snacks, preparation	<p>How is it generally eaten? How else can it be eaten? How do we cook it?</p> <p>Carrots are most nutritious eaten raw, by themselves or in salads. Raw carrot, celery and cucumber sticks make crisp and refreshing snacks. Grated raw carrots mix well in many dishes. Carrots can also be boiled, steamed or added to soups, stews, stir-fry and curry. Wash them well. Scrape the skin with a knife if it is dirty, damaged or has been stored awhile. If it's fresh, just wash it – there's goodness in the skin too.</p>
Easy to grow	<p>How easy is it to grow here?</p> <p>Very easy to grow, but get the right variety for your climate and soil. Cool climate varieties may not form a root in hot lowlands – instead they grow tall and go to seed. Short, fat varieties are suited to clay soil; longer varieties need deep loose soil.</p>
Time frame	<p>How long does it take to grow? When should it be planted and harvested?</p> <p>Normally plant carrots in spring and harvest 3-4 months later. Tropical varieties are planted in autumn and harvested at the beginning of the warm season.</p>
Propagation/ planting instructions	<p>How big is it? How much space does it need?</p> <p>It needs 30-50 cm square per plant.</p>

	<p>Where should we plant it? Carrots like deeply dug, well-manured soil. Plant in a sunny well-drained place. Carrots should follow a leafy vegetable in crop rotation.</p> <p>How do we plant it? Does it need transplanting/thinning? Buy good seeds, or save seeds from a plant left to flower in the second year (carrots grow the root one year and the seeds the next). Sow seed 1-2 cm deep directly into garden beds in rows 40-50 cm apart. After 2-3 weeks, thin to 5 cm apart. Eat the thinnings if they are big enough.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade? Carrots grow slowly at first. Keep them growing by sprinkling animal manure or compost along the rows every few weeks. Water regularly. Keep weeds down by shallow hoeing.</p> <p>What attacks it? And what do we do about it? a) Aphids and leaf hopper insects sometimes attack leaves and can give plants a disease which makes the leaves yellow and twisted. Spray soapy water if they get really bad. b) The grubs of "carrot rust fly" burrow into the roots. They hatch from eggs laid in cracks in the soil. To keep them away, dig the soil over well and practise good crop rotation.</p>
Productivity	<p>How much will it produce? Big carrots (Chantenay, Kuroda) are up to 0.3 kg, "finger" varieties about 0.1 kg.</p> <p>How long does it go on producing? Dig carrots as you need them (up to two months), or dig out the whole lot at one time.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? Carefully loosen the soil on either side of a row of carrots and pull them out by the leafy tops. Wash and brush them clean. Store in a cool, dark place in a moist sack or plastic bag to keep them from drying out.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? If protected from heat and drying out, fresh roots last one to two months.</p>
Other uses	<p>What else can we do with it? Feed the waste stalks and leaves to animals.</p>
Culture	<p>Wild carrots have been eaten since ancient times. Ancient Greeks wrote that carrots were good for the eyesight and made people feel friendly to each other. In World War II, soldiers and pilots were fed lots of carrots to help them see in the dark! Today scientists have bred carrots with 300 times as much vitamin A as the original carrots had, for health not war. Who needs guns when you have super-carrots?</p>

Food Factsheet: DARK GREEN LEAVES

(many species)

Green leafy foods are important for strong healthy bodies. Amaranth, spinach and lettuce are easy to grow. But there is a huge variety of edible green leaves. Some come from trees, herbs and plants in swamps or ponds. Don't neglect them! Many are semi-wild, like lotus, fern shoots, tamarind and baobab. Trees at school give shade and shelter – plant some that you can eat as well!



Names, varieties, relatives	What food is this? Are there different varieties? Common green leafy vegetables are amaranth (pictured here), water spinach (<i>Ipomea aquatica</i>), and lettuce (<i>Lactuca sativa</i> and <i>L. indica</i>). Some other leaves good to eat are from cassava, sweet potato, pumpkin, sweet bush (katuk, <i>Sauropus</i>), taro, basella nightshade (Ceylon spinach, <i>Basella rubra</i>), beans, buckwheat, spinach (<i>Spinacia oleracea</i>), nettle, turnip and beet, even seaweed.
Nutritional value	Is it good for us? What is its nutritional value? Who is it good for? Leaves contain more protein than any bud, flower, fruit, root or tuber. They are very rich in vitamins A, B and C. (To really know your ABCs, eat dark green leaves!) They are also the best plants for iron and calcium – especially important for children and their mothers. Dark green leaves have the most vitamins and minerals.
Dishes, combos, snacks, preparation	How is it generally eaten? How else can it be eaten? How do we cook it? In most countries, green leaves are added to the relish or stew that goes with the <i>staple food</i> (like rice, maize, yam, potato). They add not only extra goodness, but also flavour. A little oil in the cooking helps you get more vitamin A. Lettuce is very popular as a salad sprinkled with a dressing of lemon juice (or vinegar) and vegetable oil. Use big green edible leaves to wrap up mixed parcels of meat or seafood with beans, rice or maize. Steam or bake the parcels.
Easy to grow	How easy is it to grow here? Very easy to grow. Amaranth is a hardy plant, but lettuce and water spinach need regular watering.
Time frame	How long does it take to grow? When should it be planted and harvested? Plant and harvest all year round. Start picking leaves after about 4 weeks.
Propagation/ planting instructions	How big is it? How much space does it need? Amaranth is open and leafy, while lettuce can form a head of leaves, like cabbage. It is low and needs 10-25 cm between plants, depending on variety. Water spinach is a succulent branching vine that trails over a whole garden bed like sweet potato. Plant 25 cm apart.

	<p>Where should we plant it? Plant amaranth and lettuce in raised beds of sandy soil. Water spinach grows well along a creek or drain, downhill from the garden tap or well.</p> <p>How do we plant it? Does it need transplanting/thinning? Dig in animal manure or compost before planting. For lettuce, it is easiest to buy good seeds. Amaranth seeds can be saved if a plant is left to flower. Sow in seed boxes, or plant seeds 2 cm deep direct into beds in rows 25 cm apart. Thin to 15-20 cm apart, planting those thinned out elsewhere. Water spinach can be grown from a stem cutting or sown directly into garden bed rows and thinned to 25 cm apart.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade? In hot sunny places, mulch around lettuce to cool the soil, and give water spinach compost monthly. Water all these plants regularly (you can swamp water spinach).</p> <p>What attacks it? And what do we do about it? These plants are fairly free of pests and diseases. Caterpillars and aphids can attack them; snails and slugs attack seedlings and mature lettuces. Avoid these pests by using clean soil and keeping weeds down. Avoid soil-borne diseases by mulching to keep the soil cool. Spray soapy water for aphids, or plant mint as a companion to keep them away. The tips of lettuce leaves may burn when it's hot or if the weather changes a lot.</p>
Productivity	<p>How much will it produce? 20 plants will produce a bunch of green leaves every day. Some varieties of lettuce will form a head 20 cm across.</p> <p>How long does it go on producing? Lettuce and amaranth can be harvested once, or leaves can be picked regularly for 3 months or more.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? To harvest the whole plant, cut the stem at soil level. Wash off any dirt. Cut or pick single leaves close to the stem. For water spinach, harvest leafy shoots: leave some stem with a few leaves, and it will grow again. Green leaves do not keep well.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? Eat green leaves fresh to get the best food value. Some (e.g. beet and nettle leaves) can be dried in the shade, pressed flat and stored in airtight bags.</p>
Other uses	<p>What else can we do with it? The waste stalks and leaves can be fed to animals or put on the compost. The seeds of some kinds of amaranth are used to make bread or roasted and puffed for snacks.</p>
Culture	<p>Many cultures have stories of the nutritional power of dark green leaves. Indian, Tibetan and East Asian people tell the legend of Saint Milarepa who lived for about ten years in a cave in the mountains eating only nettles. He became not only healthy, but wise. During the Depression in the West when many people were poor and hungry, a humorous cartoon folk character called Popeye was created whose amazing feats of strength were due to eating spinach. Even today he is popular amongst children, promoting the idea that eating green leaves make you strong!</p>

Food Factsheet: KITCHEN HERBS

Mint (*Mentha sp.*) and others

Kitchen herbs add flavour to meals and provide extra nutrition. Some have medical properties and some make good drinks. All countries have a variety of locally popular kitchen herbs. Most are easy to grow in a small garden. A herb garden can even be in a tub or pot – great for schools with no room for a bigger garden.



Names, varieties, relatives	What food is this? Are there different varieties? Kitchen herbs are usually leafy plants that have special flavours and smells. The many different kinds of mint and sour-flavoured herbs (like lemon grass and lemon sage) have a fragrant oil in their leaves. Cousins of carrot, the tasty leaves of coriander, celery and parsley are popular. Other leaves like nettles and flowers like jasmine are made into tea for refreshment and good health. Some herbs, like coriander, anis and caraway give highly-flavoured seeds.
Nutritional value	Is it good for us? What is its nutritional value? Who is it good for? Leaves of all herbs have nutritional and health-giving powers. They are rich in vitamins A, B and C and minerals, iron and calcium, especially important for children and their mothers. Mint is good for breathing, nose and lungs. Parsley and nettles, rich in iron, are good for strong blood.
Dishes, combos, snacks, preparation	How is it generally eaten? How else can it be eaten? How do we cook it? In most countries, a few shoots or leaves are added to salads, soups, relishes or stews that go with the <i>staple food</i> (like rice, maize, yam, potato). They add flavour as well as extra goodness. Mint and others can be used for tea or in cold drinks. Mint and coriander added to breakfast soup is a favourite in East Asia. In temperate countries chopped mint and parsley are added to boiled potatoes; cumin and coriander with beans. Lemon grass cooked with chicken or fish is also tasty.
Easy to grow	How easy is it to grow here? Very easy to grow. Mint and coriander need regular watering, but lemon grass is very hardy.
Time frame	How long does it take to grow? When should it be planted and harvested? Plant and harvest all year round. Start picking leaves after about 4 weeks.
Propagation / planting instructions	How big is it? How much space does it need? Herbs are generally small leafy bushes, less than 0.4 m high and wide. Where should we plant it? Plant them in a sunny, sheltered corner of the garden or near a drain or well, in raised beds or together in a large tub. Herbs can also be planted

	<p>as companions amongst other garden plants to keep away aphids and other pests.</p> <p>How do we plant it? Does it need transplanting/thinning? Dig in animal manure or compost before planting. It is easiest to buy good seeds. Sow seeds in boxes and transplant when 5 cm high, or plant them direct 1 cm deep in rows 10-20 cm apart, then thin to 5-10 cm apart in the row. Use the thinned herbs in the kitchen. Some herbs (e.g. mint and lemon grass) can be grown from cuttings. Put cuttings into moist soil, water often, and they will grow roots.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade? Mulch around herbs to keep the weeds down and keep the soil moist. Give them a little compost monthly. Water all these plants regularly (you can swamp mint).</p> <p>What attacks it? And what do we do about it? Herbs are fairly free of pests and diseases. In fact, the flavour and fragrance of most herbs keep away insects, so it is good to have some in your garden.</p>
Productivity	<p>How much will it produce? Ten plants will produce a small bunch of kitchen herbs every day. Herbs are not used in large amounts.</p> <p>How long does it go on producing? Many herbs like mint will re-grow and can be picked for a few years. Others like coriander grow to seed and die after 4-5 months.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? To harvest the whole plant, cut the stem at soil level. Wash off any dirt. Otherwise, cut or pick leaves or shoot tips.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? Use green leaves fresh to get the best food value. Mint and many others can be dried in the shade hung up in bunches, then stored in jars or airtight bags</p>
Other uses	<p>What else can we do with it? Sweet-smelling herbs like cloves and lavender can be used to make people and houses smell good and keep out insects from cupboards and clothes. The waste stalks and leaves can be fed to animals, put on the compost or spread around vegetable seedlings to keep away pests.</p>
Culture	<p>Many cultures in the past knew a lot about local herbs and their uses. Today, especially in big cities, people buy packaged foods flavoured with artificial herbs, and have forgotten. A good school project is to find out local stories about herbs and how they are used in food and as medicine. Try asking old people in the village. In Greek legend, Mint was a daughter of a river spirit. She fell in love with Pluto, the god of the underworld, but another jealous spirit changed her into a plant. That is why (they say) mint likes to grow in damp soil, like near a stream.</p>

Food Factsheet: OIL SEEDS

Groundnut (*Arachis hypogaea*), **Sunflower** (*Helianthus annuus*), **Sesame** (*Sesamum indicum*), **Coconut** (*Cocos nucifera*)

Oil seeds can be cooked and eaten, or processed into cooking oil. Oil is made from many different kinds of seeds and nuts.

The kinds here are suitable for home and school gardens. Others like soybean and oil palm need commercial processing and are better as cash crops.



Names, varieties, relatives	<p>What food is this? Are there different varieties?</p> <p>The main kinds suitable for gardens and kitchen processing are: <i>Groundnut</i> or peanut (a kind of bean), a low bushy plant with seeds underground. <i>Sunflower</i>, a tall plant with a single huge flower full of seeds. It has oil-seed relatives <i>Safflower</i> of southwest Asia and <i>Noog</i> or <i>Niger</i> of Africa and India. <i>Sesame</i>, a small upright plant with many seed pods. <i>Coconut</i>, a tall palm tree with large nuts with oily meat and liquid inside.</p>
Nutritional value	<p>Is it good for us? What is its nutritional value? Who is it good for?</p> <p>Oil seeds have essential oils for nutrition and energy, but also valuable protein and vitamins. For example, sunflower seeds contain 20-40 percent oil, and about 40 percent easily digested protein. So as part of a balanced diet, oil seeds are good. But too much oil can make people too fat and give them heart trouble. Stored groundnuts can get infected by a fungus which makes them toxic. Don't eat them if they are mouldy.</p>
Dishes, combos, snacks, preparation	<p>How is it generally eaten? How else can it be eaten? How do we cook it?</p> <p>Seeds can be eaten fresh at harvest time, but are best after sun drying or roasting. Groundnuts can also be boiled. Eat oilseeds as snacks, put them in salads, maize or rice porridge, bread and pancakes. Pound them into paste and add to soups, stews, curries and relishes. After extracting the oil, use seeds for flavouring dishes and frying. Mix oil with vinegar for a salad dressing. The liquid in young coconuts is a refreshing drink; the fresh meat can be grated and pressed to make coconut cream.</p>
Easy to grow	<p>How easy is it to grow here?</p> <p>Easy to grow in a suitable climate. Groundnut, sesame and coconut grow well in tropical areas in free-draining soil. Coconuts prefer lowlands. Sunflowers grow in the summer in cooler places, and have deep roots which help them tolerate drought.</p>
Time frame	<p>How long does it take to grow? When should it be planted and harvested?</p> <p>Plant groundnut, sesame and sunflower late in the wet season and harvest 3-4 months later when it is dry. Plant coconuts anytime. They take 5-7 years to produce. For oil-rich coconuts, wait for them to mature and fall.</p>

Propagation/ planting instructions	<p>How big is it? How much space does it need? Where should we plant it? Plant oil seeds in a warm, sunny place. Groundnuts should grow in soft sandy soil which will not stick to the nuts. Coconuts need lots of room for their roots, and should not be too close to a building. Plant sunflowers where children can see the big attractive flowers but where they won't be knocked over by wind or playground fun. They can be grown singly, in lines or in a clump.</p> <p>How do we plant it? Does it need transplanting/thinning? Prepare a fine seedbed with compost or rotted animal manure mixed in well.</p> <p><i>Groundnut:</i> Remove shells. Plant 7 cm deep, 20 cm apart in rows 1 m apart.</p> <p><i>Sesame:</i> Sow 2-5 cm deep in rows 20 cm apart and thin to 10 cm apart in the rows.</p> <p><i>Sunflower:</i> Sow direct into beds, or start in seed boxes or pots and transplant when the first true leaves unfurl. Space them out about 50-70 cm apart.</p> <p>Sunflower and sesame can be intercropped with vegetables or grain.</p> <p><i>Coconuts:</i> Use only newly fallen nuts. Lay them flat side up in sandy soil, shaded with leaves, and water often. When they have 4-5 leaves, plant into holes 40 cm deep, half full of compost. Cover the top of the nut with leaves, not soil.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade? All oil seeds grow better if you apply compost or rotted manure a month after planting. Keep weeds out of the garden. As groundnuts grow, heap soil around the base of the plants and water them well. Sunflower and sesame don't need so much water. No need to stake sunflowers.</p> <p>What attacks it? And what do we do about it? Coconut and sunflower are fairly free of pests. The most important pests for groundnut and sesame are aphids and leaf-roller caterpillar. Pick off the caterpillars, and spray the aphids with soap spray or dust with ash. Diseases can be a problem if the plants are too close together or too wet. The best control is crop rotation, a different crop in the same place next season. If there is a lot of wilt disease, the soil needs about 5 years rest from groundnut and sesame.</p>
Productivity	<p>How much will it produce? Groundnut: 0.2-0.4 kg per square metre. Sunflower: 0.2-0.3 kg per plant Sesame: 0.1 kg per square metre. Coconut palms: about 40 nuts a year.</p> <p>How long does it go on producing? Groundnut, sunflower and sesame are harvested once. Coconuts produce bunches of nuts monthly for 40 years or more.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? Groundnuts are ready when the tops start to go yellow. Dig them up carefully so that the nuts stay on the plant. Spread the bushes on a fence or dry ground in the sun for 2-3 weeks, then remove nuts. Harvest sunflower and sesame when seeds are hard. Sesame seed capsules ripen</p>

	<p>bottom first, so cut the whole plant close to the ground as soon as the lower capsules on the stem begin to open. Cut the sunflower head or sesame stem and dry in the sun. Shake, beat or rub out the seeds onto a mat. In all countries where there are coconuts, children (and adults) can easily climb up and cut young nuts for drinking. Mature coconuts fall when ready and store well.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? Dried seeds can be kept for a year in a dry place protected from rodents and insects.</p> <p>Oil extraction at school Roast seeds and remove the seed skin by winnowing. Grind or pound the seeds into a smooth paste and gradually mix in small amounts of hot water. Heat it and the oil rises to the surface. Skim off the oil (the proteins stick together below). The protein cake can be used in cooking or fed to animals.</p>
Other uses	<p>What else can we do with it? Groundnut leaves can be eaten and the whole plant provides nutritious food for livestock. Coconut shells and timber can be made into many useful things; coconut leaves are used for thatching, for making pots for seedlings, etc.</p>
Culture	<p>Archaeologists found that groundnuts were grown 4,000 years ago in Peru. Spiced groundnut stew is a popular dish for festivals in Nigeria and Senegal, where the leaves are also added to soups and stews. Coconut is so important in most Pacific Islands that it is regarded as a national symbol.</p>

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Food Factsheet: OKRA

(*Abelmoschus esculentus* L, *Hibiscus esculentus* L)

Okra is a slightly bushy plant, a common vegetable in many tropical countries. The main food part is the immature seed pod, but the mature seeds can also be eaten. It is easy to grow in a school garden, at the right time of year.



Photo: Bill Tarpenning, ©US Department of Agriculture

Names, varieties, relatives	<p>What food is this? Are there different varieties?</p> <p>Okra is also called bhindi, gumbo and lady's finger. Some of its cousins are also food: the cassava-like leaves of a West African variety (<i>A. manihot</i>), the aromatic seeds of another East African variety (<i>A. moschatus</i>), and the succulent fruit and sour leaves of Roselle (<i>Hibiscus sabdariffa</i>). They are all grown in the same way.</p>
Nutritional value	<p>Is it good for us? What is its nutritional value? Who is it good for?</p> <p>It's a good source of most nutrients, including body-building protein, energy, vitamins and minerals.</p>
Dishes, combos, snacks, preparation	<p>How is it generally eaten? How else can it be eaten? How do we cook it?</p> <p><i>Okra</i> Young okra seed pods are eaten steamed or boiled, as a vegetable or in stews and curries. Some people cook okra with a little soda, but this makes it less nutritious. Seeds from mature pods (not young ones) must be cooked to make them safe to eat (remove toxins). Then they can be pounded into a paste/meal rich in protein and oil. Use okra leaves to flavour stews and soup.</p> <p><i>Roselle</i> The fruit and leaves can be put into stews and soup. Put roselle fruit into boiling water and leave it to cool. This makes a refreshing and colourful drink.</p>
Easy to grow	<p>How easy is it to grow here?</p> <p>Very easy to grow. Okra and roselle are grown in many tropical countries. They can survive drought and poor soil if they have to.</p>
Time frame	<p>How long does it take to grow? When should it be planted and harvested?</p> <p>Okra begins to be ready for harvest 6-8 weeks after planting. Plant early in the warm season (spring and summer); as the days get shorter, the plant flowers and produces pods in late summer and autumn.</p>
Propagation/ planting instructions	<p>How big is it? How much space does it need? Where should we plant it?</p> <p>Plant in a sunny place. Okra and roselle grow up to 1.0 m wide and 1.5 m high.</p>

	<p>How do we plant it? Does it need transplanting/thinning? Buy seeds or get a parent to donate some. Saving seeds is easy – just remove them from the pod and dry them. Before planting, soak in water overnight, then sow 1-2 cm deep directly into garden beds 0.75-1.0 m apart.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? a lot of water? shade? Okra is quite hardy. If you have poor soil, okra will grow but not produce as many pods as in rich soil. To get a good crop, add extra manure or compost at flowering. Okra can tolerate drought, but regular watering improves the crop.</p> <p>What attacks it? And what do we do about it? Pick off caterpillars, which attack fruit or leaves, or spray with a soap solution. Most diseases result from planting the same crop in the same place year after year.</p>
Productivity	<p>How much will it produce? 1 kg of okra or roselle per plant is common.</p> <p>How long does it go on producing? It goes on producing for 1-2 months.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? Pick okra pods when tender, about 10 cm long, and eat within 3 days. Roselle fruit can be stored in a shaded, cool, airy place for up to 2 weeks.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? Seeds from mature okra pods (left to harden on the plant) can be dried and stored for pounding into paste later. Roselle fruit can also be dried for long storage.</p>
Other uses	<p>What else can we do with it? Roselle is also used to add red colour to jam and drinks.</p>
Culture	<p>Roselle is widespread in tropical Africa, Asia and the Pacific where it has been gathered in the wild for thousands of years. Special varieties have been selected for sour flavour and strong red colour. Sadly, the uses and value of the hardy okra and roselle are today sometimes forgotten. Many people buy drinks bright red with artificial colour – fewer have tried the real roselle soft drink, which is much healthier!</p>

Food Factsheet: ONION

(*Allium cepa*)

When growing, onions look a bit like grass, but have hollow round leaves. The onion bulbs at ground level are also leaves – thick and juicy, and stuck together in layers, with dry papery outside leaves, which protect the bulb. Many countries consider onion and its relatives essential for adding taste, health and a wonderful smell to meals. But they are sometimes forgotten in gardens.



Names, varieties, relatives	<p>What food is this? Are there different varieties?</p> <p>There are three main types. The common onion from Central Asia forms a single bulb that can get as big as the palm of your hand. Garlic and shallots, also from cooler climates, form a clump of small bulbs that fit together tightly. Bunching onions from Eastern Asia are also called spring onions and chives. They provide leaves for eating, not big bulbs. If the soil is not heavy clay, the bulb kinds are easy to grow in cooler climates. Bunching onions are better for the tropics.</p>
Nutritional value	<p>Is it good for us? What is its nutritional value? Who is it good for?</p> <p>Bunching onion leaves have valuable amounts of vitamins A and C, which are needed by children every day. Mature bulb onions do not have much food value, but they add tasty flavours. Onion is pungent and not good for young babies.</p>
Dishes, combos, snacks, preparation	<p>How is it generally eaten? How else can it be eaten? How do we cook it?</p> <p>Put fresh slices or chopped leaves in a salad or as a garnish. Cook chopped onion with rice, beans and meat and in relishes, soups, sauces, curries and stews. Garlic or onion is great in tomato and chilli sauce and chutney. Chop bunching onions finely and sprinkle over salad, soup and noodles just before serving.</p>
Easy to grow	<p>How easy is it to grow here?</p> <p>Onions and garlic are easy to grow in places with a cool season. Bunching onion is easiest in warm areas. They grow in most kinds of soil, but need good drainage.</p>
Time frame	<p>How long does it take to grow? When should it be planted and harvested?</p> <p>Time from planting onion and garlic to harvest is about 4-6 months. Plant in temperate regions in winter or early spring. Bulbs form as the days get longer: harvest them in mid-summer. Bunching onions can be planted in the tropics all year. Allow about 2 months from planting to the first harvest of lower leaves.</p>
Propagation/ planting instructions	<p>How big is it? How much space does it need? Where should we plant it?</p> <p>Plant in a warm, sunny place. They are small upright plants which can grow close together, so you can get a lot in a small bed.</p> <p>How do we plant it? Does it need transplanting/thinning?</p> <p>For onions, it is best to buy seeds. Seeds are small but can be sown</p>

	<p>directly into beds in rows 10-20 cm apart. Thin out the seedlings to about 4-10 cm apart. Common onion needs wider spacing than bunching onion. You can transplant seedlings if you are very careful – make sure only the roots are covered with soil, and all the green leaves are above ground. For garlic and shallots, break up a clump of bulbs and plant these small bulbs directly into beds 10 cm apart. They will grow a clump of bulbs from the one you planted.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade?</p> <p>Seedlings are fragile and need protection. They will grow fast if you give them a little fertiliser (animal manure, compost and wood ash) and water them regularly. Don't use too much manure or plant too late in the season.</p> <p>What attacks it? And what do we do about it?</p> <p>Onions are fairly free of pests and diseases. Sap-sucking pests like thrips can be controlled by sprinkling water over the plant. If there's too much rain and the soil gets swamped, roots, stem and bulb may rot. For this reason, don't put thick mulch around onions. To protect your crops, don't plant onions in the same place next year, and remove and burn badly infected plants to avoid spreading infection.</p>
Productivity	<p>How much will it produce? 1-5 kg of onions per square metre is common. Garlic and bunching onions will produce 0.5-2 kg per square metre.</p> <p>How long does it go on producing?</p> <p>Common onion and garlic are harvested once, but bunching onion can go on producing a few leaves weekly for 6 months.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it?</p> <p>Onion and garlic bulbs store well. Stop watering when they are big and the leaf tops start to yellow or flower buds appear. It is easy to pull up onions at this stage. For garlic you may need to loosen the soil with a fork before pulling. Wash the bulbs, but be careful not to bruise them or break the dry outside leaves (these protect the bulb during storage). Dry them in the sun ready for storage (see below). Cut lower leaves of bunching onions weekly, leaving a few leaves to keep the plant growing. Bunching onion leaves wilt and must be eaten fresh.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How?</p> <p>Onion and garlic bulbs can keep for up to 6 months before they sprout. Just after harvest, when the bulb's leafy tops are still soft, weave onion or garlic bulbs into strings and hang them in a dry airy place like the rafters of a school house. You can also dry the outer layers of the bulbs in the sun or shade with good air-flow around them. Once the outer layers are dry they protect the inside. Keep sun-dried onions in the shade in baskets or open-weave bags (sacks don't let enough air through).</p>
Other uses	<p>What else can we do with it?</p> <p>Small onions can be pickled in vinegar and eaten as snacks. Garlic has antibiotic properties and is taken to cure colds and respiratory infections.</p>
Culture	<p>Garlic has long been used as a medicine. In ancient Europe, a necklace of garlic was worn by people to ward off evil spirits. Probably the pungent smell kept everyone away!</p>

Food Factsheet: PAPAYA

(*Carica papaya*)

Papaya is a very tasty and healthy tropical food enjoyed in many parts of the world. We can eat the ripe fruit, the green fruit, or even the male flowers in a salad. Papaya is easy to grow in the school garden, and every home should have several papaya trees.



Names, varieties, relatives	What food is this? Are there different varieties? Other name: Pawpaw. There are three types of papaya plant. There are female papayas with large flowers and fruit on short stalks. These fruit we eat. Male papayas have many small flowers and tiny fruit on long hanging stalks. We can eat the flowers, but we need them to fertilize the female papaya (one male for 8-10 females). There are also hermaphrodite papayas with both male and female flower parts: you only need one kind of tree. Commercial varieties are usually hermaphrodite (e.g. Hawaiian Solo, Thailand Red, Richter Gold and Jamaican Sweetie). Mountain Pawpaw and Babaco are relatives of papaya.
Nutritional value	Is it good for us? What is its nutritional value? Who is it good for? Very good! Half a slice of ripe papaya supplies 21 percent of the vitamin A and nearly 200 percent of the vitamin C needed by a child each day. Ripe papaya has the most vitamins. Papaya is very good for babies, children and sick people because it's full of vitamins and easy to digest.
Dishes, combos, snacks, preparation	How is it generally eaten? How else can it be eaten? How do we cook it? Eat it fresh for breakfast, with lime or lemon juice. Eat it in fruit salad, e.g. with pineapple and a little lime or lemon juice. Cook green papaya with meat or beans, or as a curry. Grate green papaya with a little lime juice and add to salad. Eat dried papaya cubes or slices as a snack. To make papaya juice, press a little ripe papaya flesh through a clean wire strainer or a clean cloth, then add some cooled boiled water. Do not add sugar.
Easy to grow	How easy is it to grow here? Very easy to grow in the right place. Papaya grows well in a warm climate, sheltered from wind, with regular rain or watering. It grows best in free-draining soil rich in organic matter.
Time frame	How long does it take to grow? When should it be planted and harvested? Plant in the warmer months. In a warm climate, the first fruit will be ready to harvest in about 6-8 months.
Propagation/ planting instructions	How big is it? How much space does it need? Where should we plant it? It grows rapidly to 3-6 m. Plant it at least 1 m from trees or buildings.

	<p>How do we plant it? Does it need transplanting/thinning? Take a ripe fruit and wash the pulp off the seeds. Sow seeds in bags or in a nursery bed. Transplant seedlings in groups of four. After first flowering, thin out to about 1.5-2 m apart. Leave one male for about nine females.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade? Mulch around each tree, from the stem out half a metre. Add animal manure if possible. Water well during the growing months but do not swamp the soil. Trees over 3 years old can be cut down to about 1 m to make harvesting easier.</p> <p>What attacks it? And what do we do about it? PESTS include mites, bugs, moths and scale insects that pierce or spot the fruit and suck out the juice. Fruit fly maggots hatch just under the fruit skin. Most pests attack the fruit when it is nearly ripe. Fruit bats, birds and small climbing animals will attack the fruit as soon as it starts to turn yellow. In a diverse garden, mites are usually controlled by other insects. A spray of 3 percent cooking oil in water can reduce mites and scales, but may also upset predators. If you cut the green fruit and leaves a white juice (latex) will come out, which deters insects. (But be careful! It will irritate your skin.) When the fruit is nearly ripe, you can tie a bag over each fruit to keep off pests, or pick the fruit when mature and let it ripen indoors away from pests. DISEASES Roots can be attacked by diseases such as damping off (<i>pythium</i>) and root rot. Anthracnose, leaf spot and powdery mildew infect shoots and leaves. These diseases cannot be controlled effectively. Remove badly infected trees and compost them away from healthy trees to avoid spreading infection.</p>
Productivity	<p>How much will it produce? An adult tree will produce 15 to 30 fruits per year. In the warmer months the tree grows faster and produces more fruit than in the cooler season.</p> <p>How long does it go on producing? The tree typically produces fruit for 5-8 years.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? When the fruit starts to turn from green to yellow, it is mature and ready to harvest. Cut the stem close to the tree trunk so that other fruits will not be hurt by the sharp end of the stalk. Green papaya can be harvested when the fruit is nearly full size, but its flesh is still hard and white. Off or on the tree, the fruit will ripen quickly, getting more yellow and soft. Handle ripe fruit carefully so that it will not bruise.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? Cut fresh ripe papaya into strips or cubes and dry it on clean banana leaves in trays or in a solar drier. Turn over the pieces two or three times a day. Store in an airtight container. Eat as a snack, or use in jam, chutney or spiced pickle relish.</p>

Other uses	<p>What else can we do with it?</p> <p>Papaya leaves and green fruit contain <i>papain</i>, which has many uses:</p> <ul style="list-style-type: none"> - To make meat tender, wrap in papaya leaves overnight. - To take away the pain of insect stings, rub with the juice of green papaya. But keep the juice out of your eyes. - For indigestion or intestinal worms, mix three/four teaspoons of the milky juice of green papaya with the same amount of honey, stir in a cup of hot water, and drink. - Use young papaya leaves instead of soap to remove stains on clothes. Rub clothes with crushed papaya leaves, then rub clothes against each other while washing.
Culture	<p>A long time ago Central American Indians found they could tenderize meat if they rubbed it with papaya fruit, or wrapped it in papaya leaves before cooking. They also found at festivals they could eat great amounts of food and not suffer indigestion if they ate papaya as well!</p>

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Food Factsheet: PINEAPPLE

(*Ananas comosus*)



Pineapples are tasty and healthy fruit. They can re-grow from side shoots for many years.

Names, varieties, relatives	<p>What food is this? Are there different varieties?</p> <p>Pineapple (also called <i>piña</i> and <i>ananas</i>) came from tropical America and is now grown in many tropical countries. Popular varieties are Smooth Cayenne, Victoria (large, used for canning, but fine for schools), Queen, Esmeralda and Albacaxis.</p>
Nutritional value	<p>Is it good for us? What is its nutritional value? Who is it good for?</p> <p>It is very good for us. Ripe pineapple is full of sugars for energy and vitamins A and C as well as minerals needed each day.</p>
Dishes, combos, snacks preparation	<p>How is it generally eaten? How else can it be eaten? How do we cook it?</p> <p>Cut off the skin and slice up the fruit. Eat fresh as a snack or in a fruit salad, or add slices or juice to flavour soup, relish, or stew. To make pineapple juice, chop and mash ripe fruit and press it through a clean wire strainer or a clean cloth, then add some cooled boiled water. Do not add sugar.</p>
Easy to grow	<p>How easy is it to grow here?</p> <p>Very easy to grow in the right place. Pineapples like free-draining soil, moderate rainfall and moderate warmth.</p>
Time frame	<p>How long does it take to grow? When should it be planted and harvested?</p> <p>Plant in the cooler months. The first fruit will be ready to harvest in 15-20 months.</p>
Propagation/ planting instructions	<p>How big is it? How much space does it need? Where should we plant it?</p> <p>Pineapples grow less than a metre high and half a square metre wide. Their roots are shallow so they need well-drained soil. Plant in a sunny place – they can tolerate some wind and drought. Varieties with prickly leaves may not be suitable for young children to work with.</p> <p>How do we plant it? Does it need transplanting/thinning?</p> <p>Pineapple is not grown from seeds, but from planting material cut off the plant: a) small shoots ("slips") which grow from the stem at the base of the fruit; b) strong side shoots ("suckers") which grow near the ground; or c) the leafy tops of the fruit. Take planting material from plants with good fruit and few slips. If you use shoots, choose the biggest ones. Plant into a raised bed with manure or compost dug through. Space 0.3 m apart in two rows in one bed – they like to grow together.</p>

Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade?</p> <p>Mulch around the rows to keep in the moisture, and add animal manure or compost every 2 months. If there is little rainfall, water moderately. Keep the weeds down.</p> <p>What attacks it? And what do we do about it?</p> <p>PESTS Mealy bug is the commonest pest. It is a small bug with a waxy coating which crawls onto the leaves and fruit and sucks out the sap. Control with a soapy water spray, or a 3 percent oil spray ("summer oil" or "horticultural petroleum oil" commonly available from farm hardware shops, or use cooking oil).</p> <p>DISEASES Pineapples can get root rot from poor drainage or from a tiny worm called a nematode. The only thing to do is remove badly infected plants (and burn them), thoroughly compost the affected area and plant a different crop there.</p>
Productivity	<p>How much will it produce?</p> <p>Each plant will produce one fruit per year, some in the cool season, others in warmer months.</p> <p>How long does it go on producing?</p> <p>Each plant produces many suckers and slips for replanting. You have to replant from suckers to get good fruit. Thin and replant suckers every 2-3 years in any case or they will produce very small fruit for a few years and then become too weak.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it?</p> <p>Harvest the fruit just when it starts to go yellow, or smell good – or just <i>before</i> it starts to go yellow, if you are sure it is mature. (If it gets fully yellow before harvesting, the inside will go brown.) Use a knife to cut the stalk at the base of the fruit. Wash the dust off the fruit.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How?</p> <p>Most pineapple is eaten fresh. Mature green fruit can be kept in a cool place for 3-4 weeks. Slices can be soaked in heavy sugar syrup for a day then dried on clean banana leaves, in trays or in a solar drier. Turn over the pieces two or three times a day. Store in an airtight container. You can also use pineapple to make jam, chutney or spiced pickle relish.</p>
Other uses	<p>What else can we do with it?</p> <p>Plant pineapples as a living fence along garden boundaries to keep out small animals. Pineapple juice is good for the stomach.</p>
Culture	<p>In a few countries pineapple is grown on large plantations for canning, drying, juice and fresh fruit, and exported all around the world. Its special flavour brings a touch of the tropics to people in cold countries. Along with the coconut, it is one of the most widely known tropical fruits and flavours in the world – but most people have never seen a pineapple growing!</p>

Food Factsheet: PUMPKIN

(*Cucurbita moschata*, *Cucurbita maxima*)

Pumpkin is a vine with nutritious fruit. Some varieties are small and some are large. The fruit is the main food part. It has a green, orange, yellow or striped skin. The tender leafy shoots and the large flowers are also healthy food, but a lot of people don't know this. Roasted pumpkin seeds make a tasty snack. Pumpkin can be grown in the warm season, or all year round in the tropics.



Names, varieties, relatives	What food is this? Are there different varieties? Other names are <i>squash</i> , <i>marrow</i> , <i>gourd</i> . Varieties like Butternut, Blue and Red have large hard-skinned fruit with firm, dry, orange flesh. In temperate or cool places they grow best in summer. Some hard varieties like Wax Gourd or Winter Squash have pale flesh and a waxy skin. Soft varieties such as Summer Squash and the common tropical or village pumpkin usually have pale flesh and are smaller. In warm places they can be grown all year. Cucumber, melon and watermelon are nutritious cousins of pumpkin, but sweeter and juicier. They all grow in much the same way. The seeds of watermelon are a popular food in some countries.
Nutritional value	Is it good for us? What is its nutritional value? Who is it good for? It's very good for us! The fruit has a lot of vitamin A and energy food. The leafy shoots have valuable protein, iron, vitamins C and A. The seeds are rich in essential oils and protein. Pumpkin flesh is good for babies, children and sick people because it's full of vitamins and easy to digest.
Dishes, combos, snacks, preparation	How is it generally eaten? How else can it be eaten? How do we cook it? Eat pumpkin as a cooked vegetable, roasted, steamed or boiled. Cook pieces in soup, stir-fry, curry, stew or serve cooked with other food. Sweet pumpkin pie, with a few spices, is a treat. Toss flowers into a stir-fry. Leafy shoots can be steamed or lightly cooked after peeling off any stringy skin from the stem. Seeds are best dried or roasted as snack food.
Easy to grow	How easy is it to grow here? It's very easy to grow. Pumpkin likes it hot and sunny. In tropical places it grows all year, but in cool places only in summer. It needs regular rain or watering. It will grow best in free-draining soil with lots of compost or manure.
Time frame	How long does it take to grow? When should it be planted and harvested? Time to first harvest is 2-4 months after planting. In a tropical place, plant any time of year, but avoid a heavy monsoon season. In cool places, plant in spring and harvest over summer and autumn.
Propagation/ planting instructions	How big is it? How much space does it need? Where should we plant it? The vines climb and the roots spread widely, so they need to be 1-2 m apart.

	<p>How do we plant it? Does it need transplanting/thinning? Pumpkin grows from seed. Use commercial seeds, or seeds from a mature pumpkin. No transplanting needed. Plant 2-3 seeds together in mounds in the wet season and in shallow holes in a dry climate. Thin out, leaving one or two vines in each place.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? lots of water? shade? A few kinds of small pumpkin grow well on a trellis strong enough to support their weight. The common tropical or village pumpkin can be grown up a trellis, over a thatched roof, or amongst maize/corn. Most are happy spreading over the ground, and their big leaves shade out weeds. When the vines are covered with flowers the shoots may be harvested or pinched off to help set the pumpkin fruit. Water regularly in hot weather to keep them growing, but don't drown the roots. Mulch with straw or leaves around the stem, especially if the pumpkin is climbing a trellis. Feed the roots by spreading a little animal manure or compost each month.</p> <p>What attacks it? And what do we do about it? Different things attack the plant in different places. Hard pumpkin varieties are hardier than soft-skinned squashes. Snails, slugs, aphids and some beetles attack the seedlings but older plants are quite hardy. Like children, a well-fed and watered plant with enough sun can outgrow most attackers. Mildew attacks the leaves if there is too much rain, shade or cold. Knock off old wilted flowers after the fruit begins to grow: sometimes they rot, and the rot can spread into the pumpkin.</p>
Productivity	<p>How much will it produce? Hard variety plants can produce 4-5 pumpkins of 5 kg each, and 100 to 200 g of seeds for snacks. Soft squash produce fruit every few days. Each plant can produce a weekly bunch of shoots or flowers for meals.</p> <p>How long does it go on producing? Most squash produce regularly for 2-3 months, but hard varieties are harvested only once, at the end of the growing season.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? Flowers, either alone or attached to baby squash, are cut or snapped off. Harvest fast-growing shoots in the same way when 15-30 cm long. Both must be eaten in a few days. Pick small squash when the fruit is about 10 cm across. Cut or snap the stalk off the vine. Soft squash dry and wilt so eat them within a few days. Hard pumpkin are harvested when the vine has died off. Wash off dirt, then store in a shaded cool place for up to 4 months. Varieties with waxy skins can last 6 months.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? Hard pumpkin and dried seeds keep well if kept cool, dry and away from rats. Sliced thinly, pumpkin flesh can also be dried.</p>
Other uses	<p>What else can we do with it? A good dose of pumpkin seeds will expel intestinal worms.</p>
Culture	<p>In the West at Hallowe'en, people hollow out the pumpkin shell, carve a face in the side and put a candle inside the shell to make a festive lamp. In South Asia, pumpkins are used in religious festivals. Seeds of melons and pumpkins, sometimes coloured red, are special snacks at the Lunar New Year in China and its neighbours.</p>

Food Factsheet: SWEET POTATO

(*Ipomoea batatas*)

Sweet potato is a vine with tasty roots and dark green leaves. The main parts to eat are the fat roots or tubers. The tender leafy shoots are a healthy food, but people who don't know that only feed them to animals. Sweet potato can be grown in the warm season or all year round in the tropics.



Names, varieties, relatives	<p>What food is this? Are there different varieties?</p> <p>Other names: Kumara. You can tell the difference between the many kinds by the shape of the leaves and the colour of the flesh, root and stem. Varieties with orange tubers grow best in hot places. Varieties with pale-flesh tubers and purple skin can grow in a cooler climate.</p> <p>Sweet potato is a cousin of water spinach (<i>Ipomoea aquatica</i>), which grows much the same way but likes wetter places. It has dark green edible leaves. <i>Yam</i> root is another nutritious food from a vine. Yams are grown like sweet potato, planted a bit further apart and given a trellis to climb.</p>
Nutritional value	<p>Is it good for us? What is its nutritional value? Who is it good for?</p> <p>It's good for us! The tubers have great food energy, yellow and orange tubers are rich in vitamin A, and the shoots have iron and vitamins. They are good for babies, children and sick people and are easy to digest.</p>
Dishes, combos, snacks, preparation	<p>How is it generally eaten? How else can it be eaten? How do we cook it?</p> <p>Eat tubers as a cooked vegetable, roasted, steamed or boiled. They can be the basis of a meal, and also eaten as snacks. Cook pieces of tuber in a stir-fry, curry, stew or soup. Sweet potato chips are great snacks. Steam the shoots or stir fry with garlic.</p>
Easy to grow	<p>How easy is it to grow here?</p> <p>Sweet potato came from tropical America and likes it warm and sunny. In the tropics it grows all year, but in cooler places only in summer. It grows best during drier weather, in sandy soil with enough compost or manure, but it even grows in low-fertility soil. It can survive dry or wet periods if there is good drainage.</p>
Time frame	<p>How long does it take to grow? When should it be planted and harvested?</p> <p>Tubers are ready for harvest 4-6 months after planting. Leafy shoots can be picked after 6-8 weeks. Plant any time of year in a tropical place except in a heavy rainy season. In cool places, plant in spring and harvest after the middle of summer. Tubers form best when days get shorter. Long days favour production of leaves.</p>
Propagation/ planting instructions	<p>How big is it? How much space does it need?</p> <p>Each plant's vines will grow to cover about half a square metre.</p> <p>Where should we plant it?</p> <p>Plant in a well-drained mound or raised bed in the sun. In a shady place it will grow leaves but not good tubers.</p>

	<p>How do we plant it? Does it need transplanting/thinning?</p> <p>Prepare ridges or mounds about 1 m apart in moist soil and mix in green plant material, compost or animal manure to make it warm. Plant either sprouted tuber tops or vine cuttings half a metre apart along the mounds. a) Tuber tops: cut 3-4 cm pieces off the tops (stem end) of stored tubers that have sprouted buds. Put them in a plate of water or damp soil till they sprout, then plant in the mounds. b) Vine cuttings: take vine cuttings from well-grown plants about 30 cm long which have already put out roots at the vine joints (<i>nodes</i>). Remove leaves from the bottom half. Plant cuttings in the mounds, angling them down with up to half of the vine buried. Keep the soil moist for a week until the roots get established.</p>
Care/ cultivation	<p>How should we look after it? Does it need staking? trellising? a lot of water? shade?</p> <p>Mulch plants with compost and feed with manure or compost every month. As the vines grow, lift them off the ground occasionally to stop roots growing into the soil at the joints. Weed them until they have spread enough to shade out weeds. Give small amounts of water regularly in hot weather.</p> <p>What attacks it? And what do we do about it?</p> <p>One of the worst pests is the sweet potato weevil. It lives in the soil, burrows in the stem and spoils the tubers. It is very small and leaves thin black or brown holes or lines in the tuber, which you usually see only after harvest. Sprinkle ash around the plant to keep them away. Rats also dig into sandy soil to eat the roots. Protect roots by making sure the base of the plant is well covered with soil, especially if the soil cracks open. Don't forget – if plants have diseases, destroy them, and plant something else in the same place next time.</p>
Productivity	<p>How much will it produce? How long does it go on producing?</p> <p>Light picking of shoots can be done regularly when the plant is growing well and the days are long. A good sweet potato plant will produce 2-3 kg of tubers.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it?</p> <p>Cut tender leafy vine tips about 10 cm long. They wilt, so eat them within a day or two. Dig tubers when they are big enough. If they are left growing too long, they get fibrous and tough. Gently wash or brush off the soil. Store them for 3-5 months in pits covered in cool, dry sandy soil, or wrapped in newspaper in a cool dry place. Varieties with thick skins keep longest.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How?</p> <p>Make sweet potato chips by frying or oven baking very thin slices and sprinkling with a little salt. Preserve in clean sealed plastic bags. They can last for 5 months or more. Some factories make tubers into flour or freeze them.</p>
Other uses	<p>What else can we do with it?</p> <p>All parts of the plant can be used for animal feed.</p>
Culture	<p>Sweet potato, like many other root crops, can be stored, so it was one of the foods people took with them when they went to sea. Scientists think this was how it spread from South America across the Pacific Islands into South-East Asia. In Africa and Melanesia, there are important ceremonies when planting and harvesting yams and sweet potato. Sweet potato has been so important in Papua New Guinea that tribes have had wars over the best land for growing them! In some East Asian countries people used to consider the whole plant only good for pigs..... But those pigs thrived!</p>

Food Factsheet: TOMATO

(*Lycopersicon esculentum*)



Tomato is a very tasty and healthy fruit enjoyed in many parts of the world. Tomato can be easy to grow in a school garden at the right time of year.

Names, varieties, relatives	What food is this? Are there different varieties? Tomato is a red, mostly round fruit full of tasty pulp and juice. Cherry tomatoes are small like berries, varieties like Grosse Lisse are as big as a fist. Processing varieties like Roma are in between, with more flesh and less juice and acidity. Tomato's tasty and healthy cousins are <i>capsicum</i> (sweet pepper, chilli) and <i>eggplant</i> (brinjal, aubergine). They are hardier than tomato but cultivation is similar.
Nutritional value	Is it good for us? What is its nutritional value? Who is it good for? It has valuable minerals and vitamins A and C needed by children each day. Ripe tomato has the most vitamins. Tomato is good for babies, children and sick people.
Dishes, combos, snacks, preparation	How is it generally eaten? How else can it be eaten? How do we cook it? Eat tomatoes fresh on their own. Put fresh or dried tomatoes in salads, sandwiches, chapatis, or tortillas, for snacks or meals. Cook tomato with fish, meat or beans, in curry, stew or as a sauce. To make tomato juice: Dip ripe tomatoes in boiling water to split the skin. When cool, remove the skin. Press the flesh through a clean wire strainer or a clean cloth, then add some cooled boiled water. No need to add sugar.
Easy to grow	How easy is it to grow here? Very easy to grow. Tomatoes came from Central America but now grow in all tropical and temperate regions. They like hot days and cool nights, and regular rain or watering. They will grow in most soils, but prefer free-draining rich soil.
Time frame	How long does it take to grow? When should it be planted and harvested? Tomato fruit begin to be ready to harvest 2-3 months after planting. Planting time depends on the climate. They need warmth to grow, but must have cool nights to set fruit. In sub-tropical areas, plant any time of year; in the tropics, in the cool season; in temperate places, in the summer.
Propagation/ planting instructions	How big is it? How much space does it need? Where should we plant it? Plant in a warm, sunny, sheltered place. Tomato bushes grow to about half a metre wide. Some varieties grow less than half a metre high, but other varieties will climb 1-2 m supported by a stake.

	<p>How do we plant it? Does it need transplanting/thinning? Buy seeds for the best quality. If not available, get your own. Take a ripe fruit and wash the pulp off the seeds. Sow seeds in small bags, or about 2 cm apart in a nursery bed. When seedlings are about 2 cm high and the base of the stem is purple, transplant them into garden beds about 1 m apart.</p>
Care/ cultivation	<p>How do we look after it? Does it need staking/trellising? a lot of water? shade? Tomatoes grow best if branches with heavy fruit are held up off the ground. Tie them loosely to a 2 m stake. Remove some branching shoots so that leaves and fruit don't get crowded. Lay mulch around the tree (leaves, straw, newspaper or other organic material), from the stem out half a metre. Add compost or animal manure to the mulch. Water regularly, but don't swamp the soil. Without air, roots will rot and the plant will die.</p> <p>What attacks it? And what do we about it? Many diseases (e.g. damping off, root rot, wilt, fruit rots) can be avoided by using clean soil, keeping weeds down and mulching the soil so it doesn't get too hot. Don't plant tomatoes in the same place next year. Remove and destroy infected plants to avoid spreading infection. When fruit is nearly ripe, water can carry fruit rots into cracks or insect holes: remove damaged fruit before the rot spreads. Snails, slugs and some caterpillars will chew the seedlings and shoots and eat into the fruit when nearly ripe. Pick them off by hand, or dust the plants with ash, or use an approved pesticide like Derris Dust (<i>rotenone</i>) or Pyrethrum. In a diverse garden, most other pests are naturally controlled by predator insects.</p>
Productivity	<p>How much will it produce? 10-30 kg of tomatoes from big varieties like Grosse Lisse are common.</p> <p>How long does it go on producing? A plant can produce tomatoes for 2-3 months.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it? Pick the fruit when most of the green colour has changed to red or orange. Fruit off the plant will continue to ripen and soften. Fresh fruit can be stored in a shaded, cool, airy place for up to 3 weeks.</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How? Tomato sauce or purée is an easy preserve. Lightly cook chopped tomatoes alone or with onion, garlic, and herbs. Seal in jars or bottles that have been sterilized by boiling them in water.</p> <p>To dry tomato, cut into strips, lay on trays, sprinkle with salt and dry in a sunny, airy place or in a solar drier. Turn the strips over two or three times a day. Tomatoes contain a lot of water and will probably not dry completely, so put the strips in sterilized jars and cover with edible oil to keep the air out – they tend to get spoiled by mould in plastic bags.</p>
Other uses	<p>What else can we do with it? Tomato leaves are poisonous and should not be eaten.</p>
Culture	<p>Ancient Peruvians had tomatoes 2,500 years ago. When western men first discovered tomatoes in Central America, they were wary of the beautiful bright red colour and the strange smell of the leaves – they thought they were poisonous. But the taste was delicious and they were soon called 'golden apple' in Italy, and 'apples of love' in English.</p>

Food Factsheet: TROPICAL TREE FRUIT

Fruit trees provide tasty and healthy foods for many years. There are many different kinds suited to school gardens. They provide shade and shelter and can be used to define boundaries in the school grounds. Once established, they need little care.



Names, varieties, relatives	<p>What food is this? Are there different varieties?</p> <p><i>Citrus</i> (<i>Citrus sp.</i>) – pomelo, orange (shown here), lime, lemon and many other varieties worldwide.</p> <p><i>Annona</i> (<i>Annona sp.</i>) – custard apple, sugar apple and soursop, all originally from Central America.</p> <p><i>Star Apple</i> (<i>Chrysophyllum cainito</i>) from Central America and tropical Asia; and from Africa (<i>C. alba</i>, <i>C. magalismontanum</i>).</p> <p>There are many other suitable trees, for example, fruit trees like mango, longan, date, jujube; and nut trees like coconut, candle nut (<i>Aleurites sp.</i>) and Indian almond (<i>Terminalia sp.</i>). In temperate climates, try plum, apple, walnut, chestnut.</p>
Nutritional value	<p>Is it good for us? What is its nutritional value? Who is it good for?</p> <p>Very good for us. Fruits are full of sugars for energy and vitamins A and C as well as others which children need each day to protect them from sickness. They should eat three or four fruits a day, including one after every meal.</p>
Dishes, combos, snacks, preparation	<p>How is it generally eaten? How else can it be eaten? How do we cook it?</p> <p>Eat fruit fresh as a snack or with a meal. Slice different kinds into a fruit salad. Add slices or juice to flavour soup, relish or to tenderize fish or meat (see papaya also). Fruit and meat are often combined: mango and lamb, duck and orange, apple and pork. A popular Pacific dish is fish cut up and marinated in lime juice and served with coconut milk. To make juice, press a little ripe fruit through a clean wire strainer or a clean cloth, then add some cooled boiled water. Do not add sugar.</p>
Easy to grow	<p>How easy is it to grow here?</p> <p>Very easy to grow in the right place. Tropical fruits grow well in a warm climate, sheltered from wind when they are young, with regular rain or watering. Most grow best in free-draining soil rich in organic matter.</p>
Time frame	<p>How long does it take to grow? When should it be planted and harvested?</p> <p>Plant in the cooler months. The first fruit will be ready to harvest in 2-3 years.</p>
Propagation/ planting instructions	<p>How big is it? How much space does it need? Where should we plant it?</p> <p>Citrus, Annona and Star Apple grow 2-6 m high. Plant at least 2-3 m away from big trees or buildings. A good place is where water drains from a well. Use them in the layout of the school grounds, for screens, shade or play-ground boundaries.</p>

	<p>How do we plant it? Does it need transplanting/thinning?</p> <p>The best fruit is from good varieties grafted by a nursery. But Annona or Star Apple can easily be grown from the seeds of a ripe fruit (it doesn't always work with citrus). Sow seeds in bags or pots with drainage holes. Plant out when 15-30 cm high. Space small trees like citrus 2-3 m apart, Star Apple and other bigger trees 3-5 m apart. In heavy soil, plant into mounds for good drainage.</p>
Care/ cultivation	<p>How should we look after it? Does it need staking? trellising? lots of water? shade?</p> <p>Protect trees from sun and wind for a few months so they establish well. Water well during the warm months but don't swamp the soil. Mulch around each tree, from the stem out 1 m, to keep the soil cool and feed the roots. Add manure if possible. As they grow, prune them to a shape which lets light into the fruit and air flow through the tree, cutting off dead branches to keep tree healthy.</p> <p>What attacks it? And what do we do about it?</p> <p>PESTS include mites, bugs, moths and scale insects that pierce or spot the fruit and suck out the juice; and fruit fly maggots which hatch just under the fruit skin and attack the fruit when it is nearly ripe. So do fruit bats, birds and small climbing animals. In a diverse garden, pests are usually controlled by other insects. A spray of 3 percent cooking oil or soap in water can reduce mites and scales, but may also upset insect predators.</p> <p>DISEASES Root rot can result from over-watering or poor drainage. Anthracnose causes black, dead patches on flowers and fruit. Remove and burn badly infected branches and trees to avoid spreading infection. Reduce places where pests and diseases hide by pruning the inner branches to give a good airflow through the tree.</p>
Productivity	<p>How much will it produce?</p> <p>An adult tree will produce 10 kg or more fruit per year. Some produce fruit in the cool season, others in warmer months.</p> <p>How long does it go on producing?</p> <p>Trees can produce fruit for 10-20 years or more.</p>
Harvesting/ storing	<p>How do we harvest it, clean it and store it?</p> <p>When the fruit turns from green to yellow, or softens, or smells good, it is mature and ready to harvest. Handle ripe fruit carefully so it will not bruise. Use a pole with a small basket attached to the end to collect fruit from tall trees. Raise the pole so the basket lip touches the fruit, then dislodge it into the basket and retrieve it. If the tree is easy to climb, you may not see much fruit – children will be up there snacking on it!</p>
Preserving/ processing	<p>Can we preserve it, keeping its food value? How?</p> <p>Most fruit is eaten fresh. Some fruit like mango can be cut into strips and dried on clean banana leaves, in trays or in a solar drier. Turn over the pieces two or three times a day. Store in an airtight container. Eat as a snack, or use in jam, chutney or spiced pickle relish. Citrus and Annona cannot be dried easily.</p>
Other uses	<p>What else can we do with it?</p> <p>Put damaged fruit on the compost heap or feed to animals.</p>
Culture	<p>A special kind of citrus, kumquat, features in East Asian New Year festivities. In East Africa the bark of the Star Apple is used in ceremonies to placate ancestral spirits. In the west, oranges were stuck full of cloves and hung up in cupboards to make clothes smell sweet.</p>

NUTRITION FACTSHEETS

Important information on poor nutrition and essential nutrients

1. Hunger and malnutrition	165
2. A healthy diet for schoolchildren	167
3. Nutrients in foods	171
4. Energy and nutrient needs	175



NOTES

[illegible]

HUNGER AND MALNUTRITION

Nutrition Factsheet 1

Food and water are essential elements which all human beings must have in order to live. Access to the "minimum essential food which is sufficient, nutritionally adequate and safe" is considered a human right. Hunger and malnutrition are global problems.

Hunger is the condition of a person who does not have access to enough food on a daily basis. **Malnutrition** is caused by lack of food, poor food quality and variety, and disease. Although a person might be consuming the right quantity of kilocalories (i.e. energy) daily, he/she may still be missing vital nutrients in the diet.

Many children in poor countries and communities have inadequate and unbalanced diets, which result in malnutrition. Poverty, poor sanitation, disease and economic and political instability all contribute.

Children's growth and behaviour are good indicators of their overall health. If they are small for their age and thin, tired, unable to concentrate and frequently sick, they may be malnourished. The three main kinds of malnutrition are:

- **Undernutrition** When children are not getting enough of the right mix of foods, they are often tired and do not have the energy to play. Their immune system may be weak so they become ill easily. They may also grow more slowly than normal children and may have problems learning at school. Children who are undernourished are often smaller in height than normal healthy children; they may also have thin arms and legs and their bodies are weak.
- **Overweight** If children eat too much, do not get the right mix of foods, and do not have enough exercise, they can become overweight. This may lead to adult overweight and many health problems, such as heart disease, diabetes and certain types of cancer. Overweight is on the increase in many developed and developing countries.
- **Micronutrient malnutrition** Many children do not get enough of some essential vitamins and minerals. The most common deficiencies are lack of vitamin A, iron, iodine and zinc in the diet. These "micronutrients" carry out vital tasks that make the body work well. They give good sight and skin, protect the body against disease, help to release the energy in food, and allow the brain and body to develop properly.



What are the main causes of hunger and malnutrition?

People living in poverty have limited access to food. For many, malnutrition is the result of lack of money to purchase enough food. Others may not have land on which to produce their own food; sometimes, people who have land may produce too little food to last all year round. Families not able to produce or purchase sufficient food are considered *food insecure*. Within such families, women and children often have less food than men.

The disruption of food production or distribution is another major cause of hunger and malnutrition. *Natural disasters* such as droughts, floods, earthquakes or hurricanes, may halt or disrupt food production, shipping or marketing and result in food shortages. *Manmade* disasters, including war, often limit food accessibility because they disrupt regular movement and distribution of food. During conflicts food can be used as a weapon; withholding food from civilian populations intentionally causes starvation



Photo © Mel Futter

Malnutrition is also caused, and often made worse, by *poor living conditions*, including insufficient or dirty water, poor sanitation and lack of adequate care within the home. Younger children are more susceptible to infectious diseases, such as diarrhoea, malaria, measles and coughs. Children who get sick often cannot absorb all the nutrients and their bodies will be weak.

HIV/AIDS can be another major cause of hunger and malnutrition. When adults become sick with HIV/AIDS, they are less able to farm or

earn money for food. They may also have to sell their assets (cattle, tools) to buy food and medicine. Children who are orphaned often become malnourished if one or both parents are sick or dead. They may lack food and care, or they may eat less because of grief and depression.

Another way in which HIV/AIDS causes malnutrition is because of the immediate effects of the disease. Like other sick people, adults or children living with HIV/AIDS who do not eat well or absorb enough nutrients use their own body tissues for energy and vital nutrients. They lose weight and become malnourished. People living with HIV/AIDS can prevent malnutrition and live longer by eating a healthy balanced diet, practising good hygiene and sanitation, and getting treated early for infectious diseases.

A HEALTHY DIET FOR SCHOOL CHILDREN

Nutrition Factsheet 2

A varied and balanced diet is important for protecting health and promoting proper physical growth and mental development. In the short term, it can help children and young people to improve their concentration and educational performance. It reduces some health risks, such as vitamin A deficiency, anaemia and other micronutrient deficiencies. A good diet in childhood can also help to minimize illness and chronic diseases later in life. It is especially important that girls eat well so that when they are women they are well nourished and can produce healthy babies.

WHAT HAPPENS IF SCHOOL-AGE CHILDREN ARE NOT FED WELL?

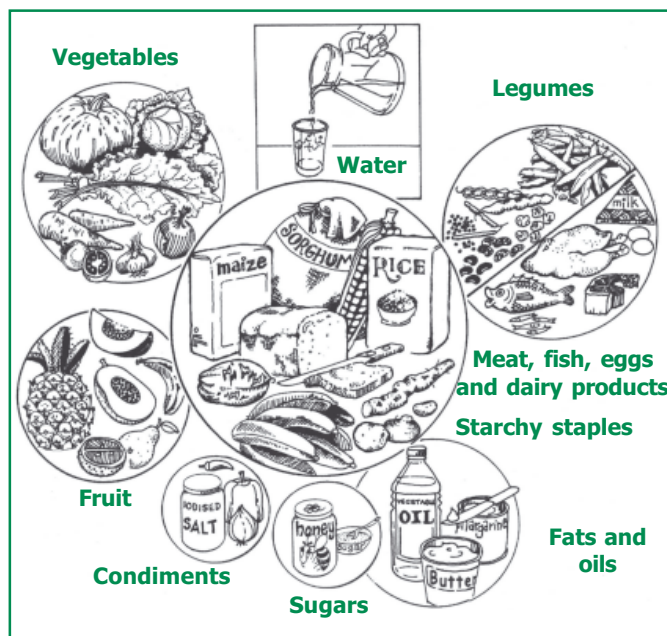
School children who are hungry or have poor diets usually grow more slowly than well-nourished children and often have little energy to play, study or do physical work. They are likely to have short attention spans and do not do as well in school as other children. Their educational achievements may be poor and they may drop out of school early. Poor nutrition during childhood not only decreases individual potential; in the long term it can also adversely affect the development of communities and nations.

WHAT IS A HEALTHY DIET?

For children five years and over, a healthy diet means a balanced diet with plenty of variety and sufficient energy for growth and development every day. This consists of:

- Plenty of fibre-rich starchy foods, such as rice, maize, bread, noodles, cassava and yams.
- Plenty of vegetables, such as dark green leafy and orange-coloured vegetables.
- Beans, peas and if possible, small amounts of meat and fish.
- Some dairy products, such as milk, eggs, yoghurt, and cheese.
- A little fat (vegetable oil, butter, ghee) added to relishes, stews and soups adds flavour and helps to absorb the vitamin A in vegetables and fruits.
- Plenty of fruits several times a day, as a snack or as dessert after meals. Fruits provide many important vitamins. The vitamin C in fruits helps to absorb the iron from vegetables, such as spinach and other dark green leaves.

Mixed Meal Guide



- Sweets and sugary foods and drinks should be limited. They are very tasty, provide additional energy and may be eaten or drunk as a special treat. Sweets and sugary foods are not essential for health but add enjoyment to eating!

HOW MANY MEALS SHOULD SCHOOL-AGE CHILDREN EAT?

Children should have three meals, plus snacks between meals, every day.

- **Breakfast, the first meal** is always important but especially if a child has to walk a long way to school and does not eat much at midday. One example of a good breakfast is starchy food (bread, porridge, roasted cassava or sweet potato) with milk, peanut butter or cooked beans, and fruit.
- **A snack mid-morning** keeps up children's energy for play and study.
- **A meal in the middle of the day** containing a variety of foods. If school meals are not provided, parents should give children food to take to school (for example: bread, or roasted cassava, tortilla, chapati, sweet potato, plus an egg and fruit). If schools provide meals or snacks, these should be as nutrient-rich as possible. Foods from the home or school garden can add variety and nutritional value.
- **An evening meal** may be the biggest meal of the day for many children and so it should be a good mixed meal (see mixed meal guide). Parents should know that fast growing children are usually hungry children and that they are not being greedy if they want a lot of food. Giving children their own plates makes it easier to check that they are getting enough of every kind of food.



NUTRITIONAL NEEDS OF SCHOOL-AGE CHILDREN

School children need plenty of good food, as their energy and nutrient needs are particularly high in relation to their size. In their overall diet, it is often difficult to achieve adequate intakes of energy, vitamin A, calcium, iron, zinc and iodine. Parents, teachers and school catering staff need to ensure that children receive plenty of nutrient-rich foods.

- Calcium is important for bone health.
- Foods rich in iron are important for preventing anaemia. Adolescent girls in particular need a lot of iron-rich foods, such as meat and fish. Their needs double when they start to menstruate. After this time and until menopause, girls and women need much more iron than boys and men. Fruits and vegetables containing vitamin C should be eaten daily, especially if there is little meat or fish in the diet. Vitamin C foods help to absorb the iron from plant foods.
- Foods rich in vitamin A are important for good eyesight, healthy skin and a strong immune system for protection from infections. Dark green leafy vegetables and yellow- and orange-coloured fruits are rich sources of vitamin A.
- Some oil or fat in the diet is essential for the body to utilize the vitamin A contained in plant foods.
- Foods rich in folate are especially important for adolescent girls and young women, in preparation for future pregnancies. Beans and groundnuts, dark green leafy vegetables, orange juice and liver are very good sources of folate.
- Foods rich in zinc are important for the body to function properly but many children do not get enough. Meats and fish are rich in zinc.
- Primary school children should get into the habit of eating plenty of vegetables and fruits.

A list of foods that are particularly rich in these and other important nutrients is set out in Nutrition Factsheet 3: *Nutrients in Foods*.

NUTRITION GUIDELINES AND STANDARDS FOR SCHOOL MEALS

Some countries have minimum national nutrition standards for school meals. These standards give the recommended nutrient content in an average meal for children over a one-week period. They also provide guidance on the types and quality of foods to be served. In a few countries, such guidelines are compulsory and set out in legislation. Check with your national ministry of education or health to find out whether your country has such guidelines. If your country does not have guidelines for school meals, find out whether there are national food-based dietary guidelines. These provide a good basis for promoting healthy diets within and outside the school. They can also guide school cafeteria personnel in menu planning and the preparation of nutritious school meals.

ADDITIONAL RECOMMENDATIONS FOR SERVING FOOD AND DRINKS IN SCHOOLS

- Clean drinking water should always be available to all pupils every day free of charge.
- Drinking milk should be available as an option every day.
- Schools should offer a variety of foods and a selection of different meals over the course of the week.
- Schools should always use iodized salt in meal preparation.
- Schools should try to purchase most meal ingredients locally. This ensures that vegetables and fruits are fresh, reduces transport costs and helps to retain wealth in local communities.
- Schools should offer a cooked meal, particularly in cold climates in the winter months. A school lunch does not have to be hot, but a cooked meal can be a morale booster during the colder months.
- School meals should reflect the likes and dislikes of children.
- Healthy eating messages and school meals should complement and reinforce each other, so as to create synergy and promote lifelong healthy eating practices.
- Soft drinks, sweets and very fatty and salty foods, such as burgers and crisps, should be kept out of the school environment. They give poor nutritional value.



NOTES

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings present.

NUTRIENTS IN FOODS

Nutrition Factsheet 3¹

Whether or not a food is a good source of a nutrient depends on:

- the amount of nutrients in the food. Foods that contain large amounts of vitamins and minerals (i.e. micronutrients) compared to their energy content are called “nutrient-rich” or “nutrient-dense” foods. They are preferred because they help ensure that the diet provides all nutrients needed. This factsheet lists foods that supply useful amounts of different nutrients;
- the amount of the food that is usually eaten.

Table 1. Useful sources of nutrients

CARBOHYDRATES

Starches	Sugars	Dietary Fibre
<ul style="list-style-type: none">• cereals• roots and tubers• starchy fruits• mature legumes	<ul style="list-style-type: none">• sweet fruits• sugar• honey• sweet foods	<ul style="list-style-type: none">• wholemeal cereals and roots• legumes• vegetables• fruits

FATS

Fats high in unsaturated fatty acids	Fats high in saturated fatty acids	Fats high in trans fatty acids
<ul style="list-style-type: none">• most vegetable oils (e.g. sunflower, maize, groundnut and olive)• wholegrain cereals• groundnuts, soybeans, sunflower seeds, sesame seeds and other oilseeds• fatty fish• avocados	<ul style="list-style-type: none">• butter, ghee and lard• whole milk (fresh or soured)• fats from meat and poultry• coconut• red palm oil	<ul style="list-style-type: none">• margarine and vegetable ghee• lard/cooking fat

PROTEINS

<ul style="list-style-type: none">• breastmilk• milk from animals• eggs	<ul style="list-style-type: none">• meat and offal of animals, birds and fish• mature beans, peas and dal	<ul style="list-style-type: none">• groundnuts and soybeans• cereals, if eaten in large amounts
---	--	--

¹ Information for this factsheet has been provided from the FAO publication (2004) Family Nutrition Guide (Appendix 1 and 2) by Ann Burgess and Peter Glasauer

IRON

Easily absorbed

- liver, blood and other offal
- flesh of animals, birds and fish (the redder the flesh, the more iron it contains)
- breastmilk

Poorly absorbed, unless eaten with meat, offal, poultry or fish, or foods rich in vitamin C

- wholegrain cereals, particularly millets and sorghum
- legumes
- amaranthus, spinach and other dark green leaves

VITAMIN A

- liver and kidneys
- egg yolks
- breastmilk, particularly colostrum
- milk fat, butter and cheese
- whole dried fish (including liver)
- fresh unbleached red palm oil
- orange vegetables, e.g. carrots and pumpkins

- ripe mangoes and pawpaws
- yellow/orange sweet potatoes
- dark/medium green vegetables, e.g. spinach, amaranthus and kale (the darker the leaf, the more vitamin A it contains)
- yellow maize and yellow bananas, if eaten in large amounts

ZINC

- meat and offal
- fish and poultry
- insects

FOLATE

- beans and groundnuts
- fresh vegetables, particularly dark green leaves
- liver and kidneys
- breastmilk
- eggs
- cereals, if eaten in large amounts

VITAMIN C

- fresh fruits, e.g. guava, citrus and baobab
- fresh vegetables, e.g. green leaves, tomatoes and peppers
- breastmilk
- fresh animal milks
- fresh starchy roots and fruits, if eaten in large amounts



Table 2. Energy, protein and fat content of some foods

Food	% EP	In 100 g edible portion of food			
		Energy		Protein	Fat
		kcal	MJ	g	g
Cereals					
Breads, white	100	261	1.09	7.7	2.0
Maize/corn					
• whole, flour	100	353	1.48	9.3	3.8
• refined, flour	100	368	1.54	9.4	1.0
• thick porridge*	100	105	0.44	2.6	0.3
• thin porridge*	100	54	0.23	1.4	–
Millet, bulrush	100	341	1.43	10.4	4.0
Rice, polished					
• raw	100	361	1.51	6.5	1.0
• boiled*	100	123	0.51	2.2	0.3
Sorghum, whole, flour	100	345	1.44	10.7	3.2
Starchy roots and fruits					
Cassava					
• fresh	74	149	0.62	1.2	0.2
• dried or flour	100	344	1.44	1.6	0.5
• fresh, boiled*	100	149	0.62	1.2	–
Plantains, raw	66	135	0.56	1.2	0.3
Potatoes, Irish, raw	80	79	0.33	2.1	0.1
Sweet potatoes, raw	80	105	0.44	1.7	0.3
Yams, fresh, raw	84	118	0.49	1.5	0.2
Legumes					
Beans and peas, dried, raw	100	333	1.39	22.6	0.8
Groundnuts, dried, raw	100	567	2.37	25.8	45.0
Soybeans, dried, raw	100	416	1.74	36.5	20.0
Sunflower seeds, raw	100	605	2.53	22.5	49.0
Animal foods					
Breastmilk	100	70	0.29	1.0	4.4
Cow's milk	100	61	0.26	3.3	3.3
Eggs	88	158	0.66	12.0	11.2
Meat with some fat (goat)	100	161	0.67	19.5	7.9
Chickens/poultry	67	140	0.59	20.0	7.0
Fish flesh, fresh	100	90	0.38	18.4	0.8
Fish flesh, dried, salted, large	100	255	1.07	47.0	7.4
Oils, fats and sugar					
Edible oils/lard	100	900	3.76	0	100.0
Butter/margarine	100	718	3.00	0	82.0
Sugar	100	400	1.67	0	0

Source: FAO. 1993. *Food and nutrition in the management of group feeding programmes*. Rome.

kcal = kilocalorie.

MJ = megajoules (joules are the modern unit for measuring energy. 1 000 kcal = 4.18 MJ).

%EP = Percent edible portion = proportion of the 'as-purchased' weight of food which can be eaten expressed as a percentage.

– = trace.

* = values calculated. The amount of flour in thick and thin maize 'porridge' varies. These are approximate values only.

Table 3. Nutrients in selected foods

Food	Rich source of:	Useful source of:
Cereals	Starch, fibre	Protein B-group vitamins Some minerals
Starchy roots and fruits	Starch, fibre	Some minerals Vitamin C if fresh Vitamin A if yellow
Mature beans and peas	Starch, protein, fibre	B-group vitamins Some minerals
Oilseeds	Fat, protein, fibre	B-group vitamins Some minerals
Meats and fish	Protein, iron, zinc	Other minerals Some vitamins
Liver (all kinds)	Protein Iron Zinc Vitamin A Folate, Other vitamins	-----
Milk and milk foods	Fat Protein Some minerals Some vitamins	-----
Breastmilk	Fat Protein Most vitamins and minerals except iron	Iron
Eggs	Protein Vitamins	Fat Minerals (not iron)
Fats and oils	Fat	-----
Dark/medium green leaves	Vitamin C Folate	Protein Some iron Fibre Vitamin A
Orange vegetables	Vitamin A Vitamin C	Minerals Fibre Fibre
Orange fruits	Fruit sugar Vitamin A Vitamin C	Fibre
Citrus fruits	Fruit sugar Vitamin C	-----

Source: Adapted from Burgess *et al.*, *Community nutrition for Eastern Africa*, AMREF, Nairobi (1994)

ENERGY AND NUTRIENT NEEDS

Nutrition Factsheet 4¹

Use the following table to compare the energy and nutrient needs of different members of the family.

Daily recommended intake for energy and nutrients

SEX/AGE	BODY WEIGHT	ENERGY		PROTEIN	IRON	ZINC	VIT A	VIT C	FOLATE
Years	kg	kcal	MJ	g	mg	mg	mcg RE	mg	mcg DFE
Both sexes									
0–6 months	6.0	524	2.19	11.6	0 ^a	1.1	375	25	80
6–11 months	8.9	708	2.97	14.1	9	0.8	400	30	80
1–3	12.1	1022	4.28	14.0	6	8.4	400	30	160
4–6	18.2	1352	5.66	22.2	6	10.3	450	30	200
7–9	25.2	1698	7.10	25.2	9	11.3	500	35	300
Girls									
10–17	46.7	2326	9.73	42.6	14/32 ^b	15.5	600	40	400
Boys									
10–17	49.7	2824	11.81	47.8	17	19.2	600	40	400
Women									
18–59	55.0	2408	10.08	41.0	29/11 ^c	9.8	500	45	400
Pregnant		+278	+1.17	+6.0	High ^d	15.0	800	55	600
Breastfeeding		+450	+1.90	+17.5	15	16.3	850	70	500
60 and over		2142	8.96	41.0	11	9.8	600	45	400
Men									
18–59	65.0	3091	12.93	49.0	14	14.0	600	45	400
60 and over		2496	10.44	49.0	14	14.0	600	45	400

Sources: Energy – FAO. 2004. *Human energy requirements*. Report of a Joint FAO/WHO/UNU Expert Consultation. FAO Food and Nutrition Paper No. 1. Rome; Protein – WHO. 1985. *Energy and protein requirements*. Technical Report Series 724. Geneva; Micronutrients – FAO/WHO. 2002. *Human vitamin and mineral requirements*. Report of a Joint FAO/WHO Expert Consultation. Rome.

Notes

kcal = kilocalorie; MJ = megajoules (joules are the modern unit for measuring energy. 1 000 kcal = 4.18 megajoules)

RE = retinol equivalents;

DFE = dietary folate equivalents

These values assume that:

- children are breastfed for at least the first year;
- older children and adults eat small amounts of iron-rich foods (e.g. meat), other animal proteins and vitamin C-rich foods, and large amounts of staple foods such as maize. The bio-availability values used for iron are '10% bio-availability', and those used for zinc are 'low bio-availability';
- adults have moderate physical activity.

a Full-term babies are born with sufficient iron stores for six months.

b Amount needed when menstruation starts.

c Amount needed after menopause.

d Needs are so high that iron supplements are usually recommended for pregnant women and pregnant adolescent girls.

¹ Information for this factsheet has been provided from the FAO publication (2004) *Family Nutrition Guide* (Appendix 1 and 2) by Ann Burgess and Peter Glasauer.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

HORTICULTURAL NOTES

Beneficial garden creatures	179
Companion planting	180
Compost	181
Conserving and preserving garden foods	182
Crop rotation	183
Garden beds	184
Harvesting	185
Healthy plants	185
Homemade sprays	186
Intercropping	187
Mulching	187
Nutrients and fertilisers	187
Organic gardening	189
Pests	190
Plant problems	191
Planting and transplanting	192
Protecting the garden	193
Snacks and drinks from the garden	194
Water management	194
Watering plants	195
Weeds	195









NOTES

[illegible]

BENEFICIAL GARDEN CREATURES




Many beneficial insects are predators or parasites which eat up harmful insects. These are the Pest Police. Some are pollinators which fertilise plants so they can produce fruit. Without them, there would be no agriculture.

(Adapted from "Beneficial insects" Virginia State Univ., www.ext.vt.edu/departments/entomology)

<p>1. Everyone knows the ladybug, or ladybird*. Some ladybugs eat aphids, others prefer scale insects and mites. They are very effective at getting rid of pests. Ladybug larvae also prey on aphids. They are colourful and look fierce, so people often think they must be harmful to people or plants. Nothing could be less true.</p>	
<p>2. The praying mantis*, with its folded legs in prayer position, is another well-known insect predator. Both adults and young lie in wait for insects that stray too close, then grab them with their modified front legs.</p>	
<p>3. Assassin bugs are found in tropical countries. Most kinds have slender bodies and dull colours so they are not noticed. They have a curved "beak" which they use to pierce beetles, grasshoppers and caterpillars.</p>	
<p>4. Ground beetles (e.g. Carab) are often found under logs and rubbish. Both larvae and adults feed on insects, slugs, snails, snail eggs and mites.</p>	
<p>5. The Lacewing fly has green filigree wings and metallic eyes. Close up, the larvae are like miniature monsters. Both adults and larvae hunt for scale, aphids, mites, mealy bug, thrips and whitefly. The larvae eat up aphids at the rate of 60 per hour and sometimes stick the empty bodies on their bristles as camouflage!</p>	
<p>6. Soldier beetles or pirate bugs are slender, brownish red or yellowish, with long antennae. They are often seen on flowers, but both adults and larvae are carnivorous. Like their cousins fireflies and glow-worms, they secrete a material which liquefies their prey. They have a "piercing-sucking beak" which they use to suck their victims dry. Each adult pirate bug can eat 5 to 20 thrips larvae per day.</p>	
<p>7. Hoverflies or robber flies are a large and useful family. Some fat kinds look like bees; others with narrow waists mimic wasps. They hover in mid-air and dart in to get pollen or nectar from flowers. Their larvae prey on aphids – one larva may eat 900 aphids! The adults are more effective predators than ladybugs.</p>	
<p>8. Centipedes feed on slugs, snails (and their eggs), mites and insects. Be careful! They can give a painful bite.</p>	

* © Mel Futter, pub *Big Issue Namibia*, 2004

Photos: Ken Gray, © Oregon State University, www.govlink.org

	<p>9. Spiders and scorpions are also dedicated hunters. Spiders use six eyes, eight legs, poisonous fangs and sticky, transparent webs to hunt on the ground or in the air. If you find their webs in your garden, leave them there!</p>
	<p>10. Many small wasps and flies are parasites on other insects. They are valuable allies. Tachinid flies, for example, lay their eggs on caterpillars. When they hatch, the fly maggots burrow through the caterpillar's skin and feed on it.</p>
	<p>11. Pollinators Many insects pollinate flowers: wild bees, flower flies, butterflies. The best known is the honey bee, which also gives us honey and beeswax. Without pollinators there would be no citrus fruit, nuts, berries, coffee, melons, cucumbers, squash, or other fruits and vegetables. Without them, farmers could not grow crops.</p>

COMPANION PLANTING

Planting particular plants together can attract good insects and drive away pests. In general, mixed crops and strong smells repel garden enemies, while flowers attract beneficial insects. "Companion planting" is a natural way to protect plants.

Flowers which attract beneficial insects are camomile, carrot, celery, clover, coriander, daisy, dill, canna, carrot, citrus, mint, nasturtiums, parsley, parsnip, rosemary, rue, thyme and yarrow. Let some of your vegetables flower.

Strong-smelling plants which deter pests by "putting them off the scent" are aloe vera, artemisia, basil, calendula, camomile, catnip, chilli, chives, citronella, garlic, ginger, horehound, lantana, lavender, leeks, lemon grass, marigold, mint, onions, tansy, thyme and tobacco.

Plants which repel soil pests

Garlic plants kill off some fungi in the soil.

Some marigolds kill nematodes in the soil. Get the right kind.

Cabbage smell repels soil pests.



Special combinations. Some say these combinations work well. Try them and see!

- Basil repels tomato hornworms.
- Nasturtiums get rid of squash bugs.
- Marigolds, mint, thyme and camomile drive away cabbage moths.
- Radishes trap beetles that attack cucumber and squash.
- Thyme and lavender deter slugs.
- Tansy and pennyroyal get rid of ants.
- Tomatoes repel asparagus beetles.
- Beans and brassicas planted together confuse each other's pests.

Photos: Ken Gray, © Oregon State University, www.govlink.org

COMPOST

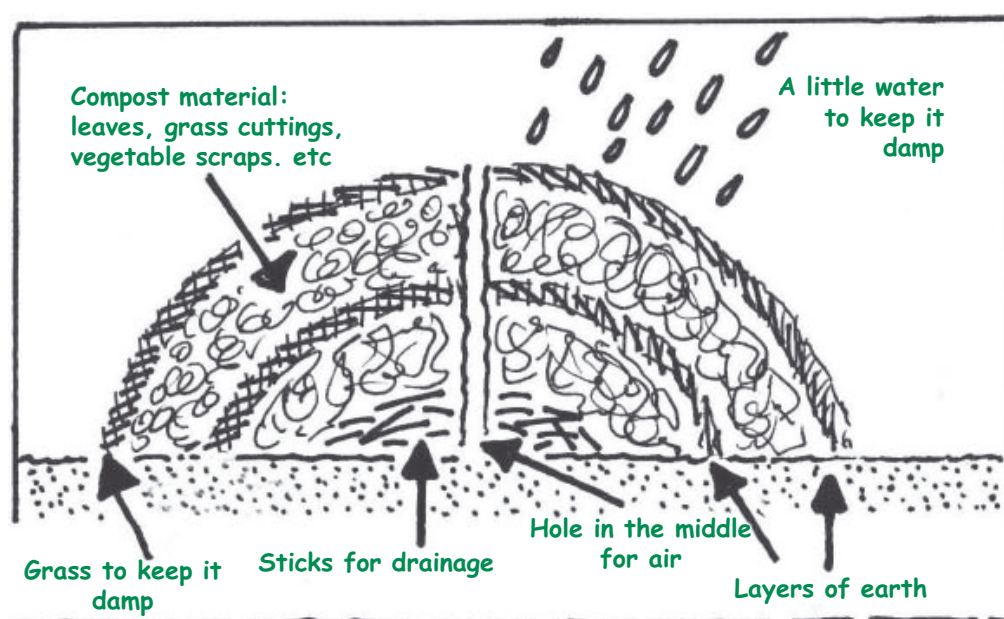
Compost, "brown gold", is the magic ingredient of good gardening. It provides nutrients to make soil rich and fertile, and keeps it moist and airy by opening up the soil, and trapping and draining water.

Compost ingredients Most organic materials can go into compost: straw, cut grass, organic waste from the kitchen, weeds, plants, leaves, animal manure, wood ash, animal and fish bones, feathers, cotton cloth, bits of leather or paper, soil. Do not use cooked food, large pieces of wood, plastic, metal, glass, crockery, wire, nylon, synthetic fabrics, coal ash, seeding grass or very tough weeds.

Compost containers Compost can be made in a bin with a roof for shelter. Having three bins is best: one to make it in, one to move it to, and one to store it. It can also be made in a pit, in a large cardboard box or in a large strong plastic bag with air holes. The important thing is keep it "cooking" by keeping it damp and giving it air.

Making compost Start with a layer of sticks for drainage, then follow with layers of grass, leaves, manure, soil. Mix wet and dry, and alternate brown and green. Chop up big leaves. Add a final layer of soil, make a hole in the middle to let air in, water the heap and cover with grass or with a cloth to keep it damp. After about five days the heap will heat up as bacteria work to break it down. Keep the compost damp. After about six weeks turn the compost – take it out and put it back, or move it to the next bin, always keeping it damp. Turn it again every few weeks. After three months test it. If it is dark, crumbly, light and moist, it is ready to use.

Using compost Use compost as soon as it is ready. Spread it before planting and when potting, and put it around growing plants every two weeks. Don't let it dry out: use it in the early evening, when it is cool, and cover with mulch to keep it damp.



CONSERVING AND PRESERVING GARDEN FOODS

General rules for processing foods are:

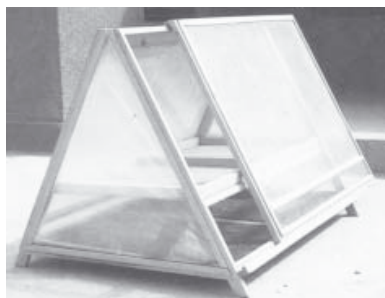
- Harvest in the cool of the evening.
- Choose ripe, undamaged items.
- Cut out any damaged or rotten pieces.
- Sterilize equipment and wash hands.

Ten simple food-preserving projects:

Hang up strings/bunches of onions, garlic, chillies, herbs, cherry tomatoes, in a cool shady airy place.

Cure sweet potatoes, yams, pumpkins by leaving them in a warm shady airy place for a week after harvesting. The skin will thicken and they will keep better. Store in a dark cool dry place.

Dry fruit and vegetables in an airy open-sided shed. Put slices of food on a rack/ mat/ tray well off the ground with its legs in water to prevent climbing insects. Turn every day until dry (vegetables) or leathery (fruit). Thin foods (e.g. green leaves) can be dried whole. Dry legumes and oilseeds on the plant. Store in a cool dry protected place.



Use a solar drier A solar drier is basically a box or frame with a plastic cover. It is not difficult to construct. Solar drying is faster and preserves nutrients better. It takes about three days for fruit/vegetable strips and slices, two days for leaves. Store dried food in airtight containers.

Make flour (e.g. pumpkin, banana, sweet potato, breadfruit, cowpea) and use it in cakes, biscuits, pancakes, weaning foods. Dry the food, then pound, sieve and store in an airtight container. For banana flour, pick bananas when three-quarters ripe. Heat them, peel and slice them, then dry the slices. Pound into flour, then sieve and store. (FAO, 1995)

Make fruit leather by cooking fruit, pulping it, then drying it. For pumpkin leather, wash, peel, cut up and cook the pumpkin, purée, strain, add honey and spices, spread on an oiled tray and dry in a solar drier. Cut the leather into squares and wrap in cellophane.

Pickle cucumber Wash 3 kilos of firm, fresh, medium-size cucumbers and put in a deep bowl. Mix salt and water, enough to cover the cucumbers. Let stand for two days. Drain, rinse and slice. Put 10 cups of sugar, 10 cups of white vinegar and some pickling spice in a pot and bring slowly to a boil to dissolve the sugar. Add sliced cucumbers to the hot syrup for a few seconds, then pack into clean hot jars. Fill jars with hot vinegar-sugar solution and seal. (Cooks Corn, 2004)



Make Kanji pickled carrot drink, popular in India. Wash a kilo of carrots and grate them into a jar/bottle. Add 7 litres of clean water, 200g salt and some hot spices (e.g. chilli, mustard seed). Close tightly, leaving a tiny hole for gases to escape. Ferment for 7-10 days. Strain. Consume within 3-4 days. (Battcock and Azam-Ali, 1998)

Make guava juice. Choose firm ripe guavas. Wash, cut off ends, slice. Cover with water in a large pot. Boil until very soft (15-20 minutes). Pour into a bag of rough cloth and let it drip

through. Drink it right away. To bottle it, sterilize bottles and lids, boil the juice again, pour into hot bottles and seal. (FAO, 2004 website)

Bottle tomatoes Use plum tomatoes, ripe but hard. Wash well and remove bad bits. Dip in boiling water for 30 seconds, cool in water, then peel. Fill jars with tomatoes. Add a small spoon of lemon juice/vinegar to each. Seal while hot. Cover jars with water in a deep pan, with straw to stop rattling. Boil for 30 minutes (small jars) or 50 minutes (big jars). Let cool and label. (FAO Rural Processing & Preserving)



CROP ROTATION

If you plan to grow the same crops regularly, you will need to rotate them. Each kind of crop needs particular nutrients in the soil and uses these up at a particular level in the ground. At the same time, each kind of plant attracts its own particular pests and diseases, which soon become established around the crop. If you grow the same kind of crop in the same place season after season, the nutrients that the plant needs are quickly exhausted, the plants grow weak and stunted and quickly come under attack from waiting pests and diseases.

Crop rotation restores the soil and frustrates the pests and diseases. The main crop families to be rotated are:

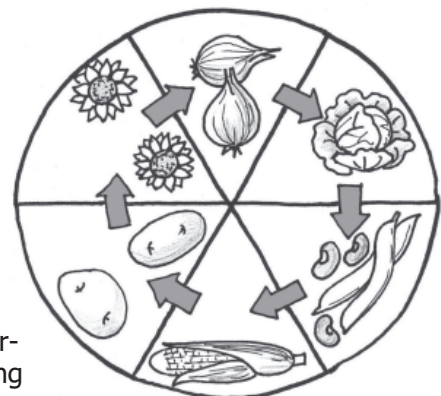
Legumes	<i>leguminosae</i>	e.g. beans, peas
Solanums	<i>solanaceae</i>	e.g. tomatoes, peppers, potatoes, chilli, eggplants
Cucurbits	<i>cucurbitaceae</i>	e.g. cucumber, squash, melon, marrow, pumpkin
Brassicas	<i>brassicaceae</i>	e.g. broccoli, cabbage, cauliflower, kale, radish, rutabaga
Grains	<i>gramineae</i>	e.g. corn, millet, sorghum, wheat
Bulb crops	<i>amaryllidaceae</i>	e.g. onions, leeks, garlic, chives
Umbells	<i>umbellifereae</i>	e.g. carrots, fennel, chicory, parsnip, parsley, sesame
Greens	<i>chenopodiaceae</i> and <i>compositae</i>	e.g. beet, chard, spinach, lettuce

(Adapted from Coleman, 1989)

Some "rotation tips" are:

1. Rotate over at least three seasons (five or six is better).
2. Change the plant *family* every time, not just the individual crop.
3. Leave at least a metre distance when planting the same crop again.
4. Grow green manure as part of your rotation – e.g. cereal grains (millet, oats), beans, vetch, sun hemp (*Crotalaria juncea*). They put back organic matter and rebuild the soil. Dig them in before they flower, or cut and leave as mulch.
5. Leave one field/bed fallow, with no crops, as part of the rotation. This gives the soil a rest.
6. Grow sunflowers (or alfalfa or safflowers) as part of the rotation. Their roots go deep into the soil for nutrients and water.
7. Some good combinations:
 - Grow corn after legumes.
 - Grow potatoes after corn.
 - Grow brassicas after onions.

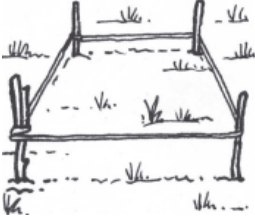
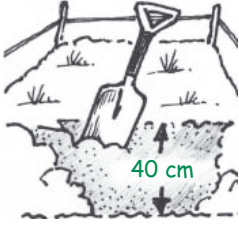
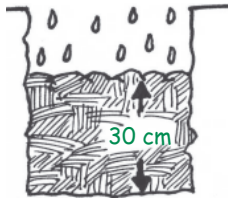
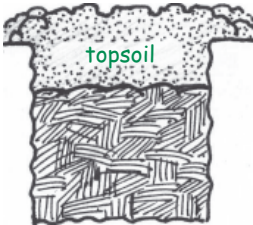




Older children with a little experience of gardening can understand the principles of crop rotation and apply them in making decisions about what to grow.



GARDEN BEDS

Permanent raised beds In this Manual we advocate permanent raised beds, which are easy to maintain, highly productive and excellent for improving the soil.

Making raised beds:

<p>Mark out beds</p> 	<p>Dig over beds only</p>  <p>40 cm</p> <p>Dig about 40 cms deep</p>	<p>Add compost/manure/organic material (30 cm). Water and put back soil.</p>  <p>30 cm</p>	<p>Add topsoil from the paths</p>  <p>topsoil</p>
<p>Flatten the top of the bed</p> 	<p>Don't walk or kneel on it and squash the soil</p> 	<p>"Minimum tillage"</p>  <p>Protect soil structure Add compost, mulch but never dig again</p>	<p>Plant densely</p>  <p>Keeps down weeds Conserves moisture</p>



Other kinds of beds:

Flat beds are easy to establish but not so productive.

Sunken beds trap water and are good for dry climate or dry seasons.

Ridged beds are good for root crops. The ridges help rain drain out of heavy soil.

Permaculture Where soil is poor, permaculture beds can be built on top of the ground by filling in a border with organic matter.

Containers (e.g. plant pots, old car tyres) are movable, good for limited space and for display.

HARVESTING

Gardeners should know if the crop must ripen on the plant or can also ripen off the plant. Harvesting should ensure that produce is fresh and undamaged. It should be done in the cool of the day. Produce should be handled carefully to avoid damage. Store only perfect foods; use up damaged foods quickly before they rot. Store foods in cool dry conditions. For transport, fruit should be packed carefully so it will not get hurt. Old plants can be left in the soil as compost.



HEALTHY PLANTS

Integrated pest management employs a range of natural methods to reduce and control pests and diseases. Ensuring that plants are healthy is the first strategy. Plants should be monitored regularly and treated immediately. The checklist below covers the main points to be checked.

Plant Patrol Checklist

1. Growth	Have the plants grown? What stage are they at? Any fruit/seeds?
2. Health	Are they looking well? Are there signs of pests or diseases? Are any plants wilting or stunted? Are there fallen leaves, eaten leaves, yellow leaves, fungus?
3. Garden creatures	What insects/worms/animals are around? Are there plenty of beneficial creatures (e.g. lacewing, ladybug, frogs, lizards)?
4. Soil/water	Is the soil dry? Which plants or beds need water? Is anything too wet?
5. Mulching	Is everything well mulched? Where do we need more mulch?
6. Protection	How good is our protection against predators (e.g. fences, walls, scarecrows)?
7. Wind and sun	Is anything getting too much wind, sun or shade?
8. Space	Is anything overcrowded? Does anything need thinning/transplanting?
9. Weeds	Are there a lot of weeds near the plants?
10. Support	Does anything need training up, tying up, spreading out?
11. Hygiene	What needs tidying up? Burning? Cutting back? Cutting down?
12. Compost	How good are our supplies of compost and mulch?

HOMEMADE SPRAYS

The sprays below are cheap to make and effective against a range of pests, while also relatively safe for children to make and use.

Chilli pesticide spray To control aphids and other sucking insects. Slice a handful of dried chillies and some onion or garlic and mix together in a litre of water. Grate in a small handful of hard soap. Leave overnight, then strain through a cloth and add 5 more litres of water. Brush, sprinkle or spray on affected plants, but not in direct sunlight. Don't get it on your skin or in your eyes. If plant leaves burn, make the mixture weaker with more water. Repeat the treatment as often as necessary. (Adapted from FAO, 2001)

Simple soapy water spray For sucking insects. Use one teaspoon to two tablespoons of normal liquid detergent soap for every four and half litres of water. Spray as often as needed, especially under the leaves. Increase the amount of soap if necessary. (Guy *et al.*, 1996)

Flour or ash dusted onto leaf vegetables suffocates caterpillars. Flour is also a stomach poison for them. (Chris Landon-Lane, 2004)

Tea or coffee spray To deter insects. Soak coffee grounds or tea leaves in water and spray on plants.

White oil or "summer oil" spray To suffocate chewing and sucking insects. Make a concentrated mix with half a litre of vegetable oil (e.g. coconut oil) and half a cup of detergent or soap dissolved in water. To spray, mix 1 tablespoon of the mixture in a litre of water. If you store the mixture, shake well before using to mix up the ingredients. (Adapted from ABC Brisbane, 2004)

Bug juice made with the bugs themselves is effective against caterpillars, slugs, larvae and bugs. Catch and kill a few of the pests which are attacking your crops, cover with water, grind to a paste and strain through a fine sieve or cloth. Dilute 50 ml in 10 litres of water – then spray their friends and relations! (C. Landon-Lane, personal communication, 2004)

Tomato leaf juice Useful in controlling aphids and caterpillars on many plants. Boil 500 grams of tomato leaves in 5 litres of water. Strain and dissolve 30 grams of soap in the mix. For spraying, use one part of the mixture to 4 parts of water. N.B. Do not use this mixture on tomato plants or members of the tomato family (e.g. pepper or Irish potato). (ABC Brisbane, 2004)

Marigold leaf juice made the same way as tomato leaf juice, is a powerful, broadspectrum pesticide (it even deters fleas on dogs!). Wild marigold, which comes up in fields, on roadsides or any patch of disturbed soil, is much more effective than the garden variety.



TIP

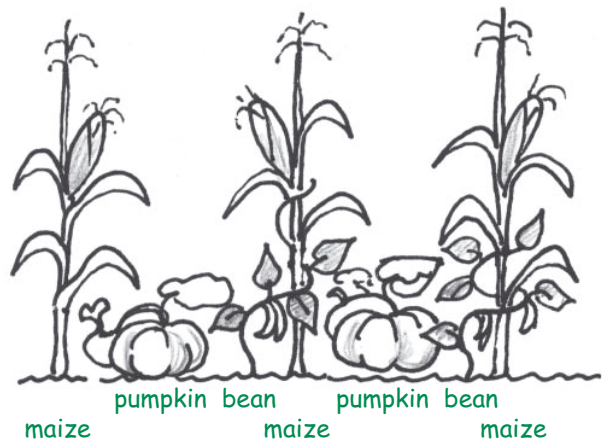
Spray bottles are not always easy to come by. A large paintbrush, broom head or tied bundle of grass will work just as well. Dip this into a bucket of the pesticide and shake it to splash the mixture onto the plants.

INTERCROPPING

Intercropping (growing different crops near to one another) helps to utilize and conserve the soil and protect plants. A multi-layered garden, with plants at different heights, is a form of intercropping that makes the most of garden space and sunshine.

Putting plants with different needs together cuts competition. In particular, try growing:

- tall plants next to small ones, e.g. maize with cabbage, broccoli with spinach/lettuce, fruit trees next to vegetables;
- deep-rooted plants next to shallow-rooted plants, e.g. maize with sorghum and pigeon pea;
- climbing plants next to ground plants, e.g. passionfruit, beans or corn with lettuce, onions, carrots or squash;
- broad leaves next to narrow leaves, e.g. cabbage with carrots.



MULCHING

Mulching means putting dry organic material (grass, straw, leaves) about 6 cm deep around the base of plants. The mulch keeps moisture in the soil, keeps the soil surface cool and soft, prevents weeds, and gradually decays like compost to enrich the soil. It is particularly useful where the soil is poor or there is very little water, in hot climates and hot seasons. The best mulching material is light-coloured and reflects the light. Use grass and weeds before they produce seeds, otherwise you will be providing competition instead of reducing it!



NUTRIENTS AND FERTILISERS

Plants need

- potassium for health and strength;
- nitrogen for leaves and growth;
- phosphorus for roots, flowers and fruit.

Fertilisers can supply these nutrients There are:

- **Inorganic fertilisers** (e.g. ammonium nitrate, ammonium sulphate and ammonium phosphate). These are quite expensive. They give quick results but don't help the soil structure in the long term.
- **Organic fertilisers** (e.g. bone meal, blood meal, seaweed, manure). These cost a little more than inorganic fertilisers, but they improve the soil structure as well as add nutrients.

- **Homegrown organic fertilisers** (e.g. green manure, compost and animal manure). These cost very little, improve the soil structure, and provide nutrients as well.

Animal manure Use manure from plant-eating animals. Fresh animal manure hurts roots: either leave it for six months or add it to compost.



Green manure gives a rich airy soil. Grow legume crops and dig them in or use them for compost. For example:

- (field crops) beans and peas, sunhemp, groundnuts, water hyacinth
- (hedgerow crops) *leucaena*, *Flemingia sp.*, *Gliricidia sp.*, pigeon pea, guinea grass, *Setaria sp.* Prune and leave the branches on the ground.

Particular organic materials supply particular nutrients. Put them in your compost.

	Nitrogen N	Phosphorus P	Potassium K
Bonemeal or bones	✓	✓	
Wood ash		✓	✓
Fishmeal	✓	✓	
Green manure	✓		
Banana leaves and stems			✓
Chicken manure	✓	✓	✓
Compost and manure	✓	✓	✓
Shredded castor oil plants	✓	✓	
Coffee grounds	✓	✓	✓

ORGANIC GARDENING



Organic gardeners use natural methods to protect and improve the soil, control pests and diseases and increase production. Some ways of gardening organically are rotating crops, using compost and manure, making raised permanent beds, mulching, weeding, using good seeds, growing local varieties, treating plants well, doing companion planting, not using artificial pesticides or insecticides, harvesting rainwater, and using drip irrigation. Most of these are dealt with in detail in these *Notes*; here we summarize the important points to demonstrate the value of organic approaches.

Keeping the soil healthy The soil is full of nutrients, which go into the food we grow. When we harvest food, we remove these nutrients. If we do not put back into the soil what we take from it, it becomes “exhausted” and cannot produce good crops. Good gardeners have to protect and maintain the soil. How is this done? Chemical fertilisers put nutrients back into the soil, but they are harmful to worms and good soil fungi and are also expensive. They can burn roots; they dissolve quickly and are washed out of the soil. Organic gardeners protect and maintain the soil in other ways:

- **Crop rotation** Each kind of crop takes different nutrients from the soil. Moving the crops around gives the soil time to recover.
- **Compost, manure and mulching** Organic materials slowly rot away in the soil, put back the nutrients, improve drainage and keep the soil damp and airy.
- **Permanent raised beds** Soil is not just a bagful of nutrients. It is a structure and a system, full of life and activity. Once you have begun to create healthy soil you should not interfere with it. For example, if you dig it again deeply or walk on it, you squash out the air, make the earth hard, destroy earthworms and other useful life. This is why it is good to have permanent raised beds and let the plants and the soil do the cultivation for you.

Keeping plants healthy A popular way to keep down pests and diseases is with chemical sprays. This is expensive, and creates a lot of problems. Pesticides are poisons: they kill insects which pollinate plants, and also birds and insects which eat pests. They can also poison us if we eat sprayed foods, or breathe the air after crop-spraying.

The natural way to fight pests and diseases is to make plants healthy and resistant to pests and diseases. *Choose good seeds and local varieties, add compost, weed and mulch* to keep down the competition, *control pests* and check plants regularly.

Make sure plants have enough water, but not too much. Keep the soil damp and *add compost* to help it drain well. If water is scarce, *harvest rainwater* or *use grey water*, and use every drop – for example, use *drip irrigation* or *mulch* plants to stop water from evaporating. Grey water, or waste water from washing hands, clothes, etc. usually contains soap, so has the extra benefit of helping to control pests.




Organic gardeners encourage beneficial insects like bees, butterflies and ladybirds by growing plants that attract them. They keep away harmful pests by *companion planting* with strong-smelling plants and pick off harmful bugs, worms and beetles before they spread. They use sprays that do not harm birds and bees, and natural insecticides that disappear after doing their work.






PESTS

A few examples of harmful pests:



Chewers Most chewers are big enough to see easily. If there are holes in the leaves and fruit, ragged edges or pieces missing, look for caterpillars, beetles, weevils, grasshoppers, slugs and snails. If plants are wilting or falling over, look for root-eating crickets, beetles, millipedes.

	<p>1. Caterpillars* (Lepidoptera) <i>Example:</i> Cabbage looper butterfly and larvae</p> <p>Green caterpillars, about 1½" long, pale stripes along their backs. They "loop" as they crawl, making a little arch. They chew leaves of all the cabbage family.</p>
	<p>2. Weevils* (Chrysomeloids & Cucurlions) <i>Example:</i> Vegetable weevil</p> <p>Typical weevil "nose", 10 mm long, grey brown. The larvae are slug-shaped. They chew holes in leaves, root vegetables and plant tops. They feed at night and shelter on soil during the day.</p>
	<p>3. Slugs* and snails* (Molluscs)</p> <p>Slimy and soft-bodied. The snail has a shell, the slugs have none. They leave a silvery slime trail. They chew plant leaves and cut seedling stems.</p>

Suckers If plants are wilting or stunted, with leaves curling, yellowing, or distorted; if there is sooty mould on citrus, look for aphids, scale, mealy bugs, thrips, plant hoppers or whitefly.

	<p>4. Aphids* (Aphids)</p> <p>Tiny, yellowish green or grey/black insects, about 2-5 mm long. They suck plant juice from leaves, buds, stems and pods of vegetables, fruit trees and grains and leave a sticky "honeydew". They attack beans and the cabbage family.</p>
	<p>5. Whitefly* (Aleyrodids) <i>Example:</i> Citrus whitefly</p> <p>Tiny insects, like winged aphids. They look like scale on the underside of leaves, and fly out in clouds if disturbed. They suck plant juice.</p>
	<p>6. Scale, mealybugs* (Coccoids)</p> <p>Scale are oval, blue/red, waxy insects. They suck juice from stems, leaves, roots. Mealybugs are small white cottony pests found on the underside of leaves.</p>

Photos: * Ken Gray, © Oregon State University, www.govlink.org

<p>7. Shield bugs and Stink bugs** (Pentatomoids) <i>Example:</i> Stink bug</p> <p>Bright green, 12 mm, shield-shaped, they make a foul smell if squashed or disturbed. They leave blotches on fruits and limp seed pods.</p>	
<p>8. Leafhoppers** (Cicadelloids) <i>Example:</i> Vegetable Jassid</p> <p>Broad head, gauzy wings, 5 mm long, sometimes bright colours. They fly out in clouds if disturbed. They suck the sap under the leaves, and leave bleached blotchy areas.</p>	

PLANT PROBLEMS

It is not always easy to tell if a plant is suffering from disease, diet/water problems or pests, since a single symptom (e.g. wilting) may be a sign of any of these. But some symptoms are more specific.

	Symptoms	Remedy
Disease	<div> <div>mosaic markings</div> <div>wilting</div> <div>soggy rotten flesh</div> <div>withering</div> <div>rolled-up leaves</div> <div>oozing sap</div> <div>red and yellow streaks</div> <div>spots</div> <div>discoloured leaves</div> <div>black patches with yellow edges</div> <div>powdery substance on leaves</div> </div>	<p>DESTROY</p> <p>Burn infected plants and start again.</p> <ul style="list-style-type: none"> - Use clean seeds. - Plant in a new place. - Let the bed dry out before replanting.
Diet	<p>Lack of nitrogen</p> <ul style="list-style-type: none"> - yellow leaf veins - stunted growth - pale leaves - red colour - nearby plants have same problems <p>Lack of potassium</p> <ul style="list-style-type: none"> - edges of leaves look scorched - brown patches in leaves between veins <p>Lack of phosphorus</p> <ul style="list-style-type: none"> - purple in stems or leaves 	<p>FEED</p> <p>For all problems, give compost and mulch and rotate crops.</p> <p>For nitrogen, give compost, green manure and legumes.</p> <p>For potassium, give wood ash or wood bark.</p> <p>For phosphorus, add chicken manure or animal bones to compost.</p>

	Symptoms		Remedy
Water	too little wilting leaf tips burnt/crinkled stunted yellow leaves	too much wilting yellowing root rot stem rot	WATER OR DRAIN Water regularly OR drain the bed
Pests	Sucking insects insects on buds, leaves, stem (aphids, scale) sticky secretions sooty mould on leaves pale, brown, speckled, drying leaves or fruit Chewing insects holes jagged edges		PICK, WIPE, TRAP, SPRAY! Pick Hand pick caterpillars, slugs or snails, beetles – look in possible hiding places and you'll find them. Wipe whitefly, scale, mealybug by hand. Trap whitefly with "sticky traps". Smear yellow cardboard with petroleum jelly (Vaseline). Whitefly like yellow things. Trap slugs under citrus or potato skins, in a slug trap (e.g. a half buried can of beer or milk) or with ash or sawdust around plants. Spray with natural pesticides, or dust with wood ash or flour. Spray under leaves too. Pest police Let in ducks and hens, carry in ladybugs and lacewing, encourage frogs and lizards.

PLANTING AND TRANSPLANTING



Sowing big seeds directly in the ground

Soil should be raked finely, removing lumps, roots, stones.

Seeds should be sown at a distance that allows for the size of the mature plant. Use pegs and knotted string to mark out rows, and measuring sticks to measure distance between plants. Make furrows at a depth approximately 3 times the seed's diameter.

Add a little compost, then drop in the seeds. Cover the seeds and press down.

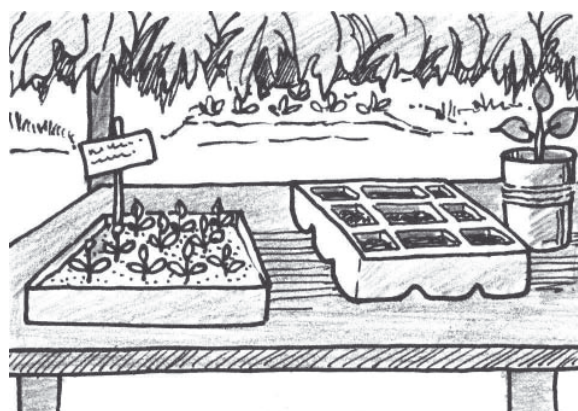
Water gently and keep damp.

Protect seeds/seedlings from sun, rain and predators with canopies (fronds or sacking) and thorns.

Small seeds need to be started in a protected seed bed, thinned out, hardened off and then planted out. Seed beds may be:

- Boxes, trays, bags, with holes for draining. These are easy to move.
- A raised garden bed with a shade over it and some protection from predators.
- Re-usable seed trays with compartments. Transplanting seedlings in their own soil ball protects the roots.

A seed tray in the classroom is good for study purposes. Cover trays with a damp cloth until seeds germinate.



Preparations Make a seed bed with fine rich soil, and no lumps, sticks or stones. Weed it well and flatten it neatly with a board. Prepare a canopy of sacking or fronds to protect the bed from sun and rain. Protect the seed bed from predators (e.g. with wall of thorns, or by putting trays on a table).

Sowing Mix seeds with fine soil or sand. Make furrows in the soil a few cm deep and about 15 cm apart. Sprinkle in the seeds and cover lightly. Water well, but don't flood. Label the rows with seed packets on sticks.

Growing Water gently twice a day – morning and evening. When seedlings appear, add mulch to keep them cool and damp and keep down competition.

Hardening off and thinning When seedlings have two leaves, harden them off for about ten days, giving them a little more sun and weather every day. When they are about 8 cm high, thin them out to about 5 cm apart by cutting them close to the ground with scissors.

Transplanting/Planting out Transplant when it's cool into raised beds. Mark lines and holes. Choose good strong seedlings, scoop them up with a little soil to keep their roots intact. Plant them in the holes, fill with soil, water right away and mulch around the plants. Water regularly.

PROTECTING THE GARDEN

Ways of protecting the garden have to take account of the commonest local animal predators, their size and number, what they attack and how they move (flying, burrowing, scratching, crawling, jumping). Local measures are generally the most economical and effective because they make use of widely available materials. Some protective measures are:

- **Walls** made of brick, concrete, stone or earth are strong but need a lot of work. Deep foundations are necessary if they are to prevent burrowing animals. Dry stone walls need constant maintenance. Rammed earth walls are easy to make, but need tiles on top to keep the water out.
- **Fences** made from brushwood, wattle or bamboo are light and easy to move but need to be renewed every year. More permanent wire fences with concrete posts should start half a metre underground to keep out



burrowers. Solar-powered electric fences can keep out big animals.

- **Hedges or living fences** keep out big animals. Plants for thorny hedges are thorny vines, brambles, thorny wild apple, sisal, pandanus or *Parkinsonia aculeata*. Other thick hedges are euphorbia, cactus, bamboo and vetiver grass. Some (e.g. pineapple, salak, lemon grass, cassava and yucca) give food as well.
- **Nets** are costly and time-consuming but effective for keeping birds, animals and insects away from fruit.
- **Scarecrows and scarers** (e.g. shiny metal or plastic strips) are fun for children to make, watch, draw and tell stories about.
- **At the grass roots level**, mini-fences of sticks or thorns protect young plants. Coverings (e.g. dry branches or sacks on sticks) keep away chickens and birds from seedlings. Coconut shells or stones can be used as earth blocks around carrots or sweet potatoes to keep diggers away from roots. Chickens are mostly beneficial for the garden, as they seldom destroy vegetables, aerate the soil by scratching and help to control pests. Marigolds planted as mini living fences around seedlings or fruit which chickens like, such as tomatoes, will keep chickens doing good and not harm to the garden.



SNACKS AND DRINKS FROM THE GARDEN



Some snacks Fruit, fruit leather, sugarcane, sweet potato, carrots, celery, maize cob, rice cakes, nuts, sunflower seeds, raw young beans and peas, bean and seed sprouts from alfalfa, barley, wheat, beans, pumpkin, popcorn (with salt or honey) made from maize or sorghum.

Some drinks Fruit and vegetable juices, herb teas and spice drinks, coconut water, bean milk from pulped and sieved black or green gram.

WATER MANAGEMENT

For wet areas or wet seasons:

Dig holes and canals to drain water.
Add compost to drain clay soil.
Grow plants that love water (e.g. rice, taro, lotus, water chestnuts).
Protect young plants from heavy rain.
Grow plants on trellises and use containers.
Don't mulch too much.

For dry areas or dry seasons:

Use "grey water" from washing.
Harvest rainwater with gutters and water tanks.
Grow crops near the water.
Prevent run-off – put beds across slopes and build up edges.
Water conservatively – use a drip system, NOT a sprinkler.
Use a lot of compost and mulch.
Provide shade for young plants.
Remove competitive weeds that steal water.
Grow dry-climate crops (e.g. mung bean, egg-plant, sweet-potato, mango, groundnut, okra).

WATERING PLANTS

Methods of watering plants

- Flood the bed – in dry places make a sunken bed to keep the water in.
- Drip irrigation – use a drip hose or soaker hose.
- Water by hand with a watering can or a plastic bottle with holes.
- Make water traps – e.g. keep the water in by digging a shallow trough round the plant.
- Water plants individually with sunken tins or upended bottles.



Watering advice

- Water seeds and seedlings gently.
- Don't drown plants by over-watering. If they need a lot of water, give it in stages.
- Water the soil, not the plants. Get the water to the roots. Water on leaves can hurt plants.
- Don't use a sprinkler – it wastes water.
- Measure moisture each day with a measuring stick. When the top 3 cm is dry it's time to water.
- Water in the morning or evening when it is cool so the water doesn't evaporate.
- Deep roots don't need more water: let plants dry out between waterings to encourage roots to grow.

WEEDS

Weeds are only harmful if they threaten crops. Some weeds attract pests like aphids and can starve crops by taking light, water and food from them, but some attract beneficial insects like bees and butterflies, while others (e.g. clover, vetch) make the soil rich with nitrogen. Here are some elements of a good organic weed policy:

- **Prevent weeds** by filling up the space between plants with mulch or ground cover (e.g. pumpkins, sweet potatoes and other vine plants). Create shade with multi-layer cropping to deter weeds.
- **Remove weeds** when the ground is damp by digging them, pulling them, or cutting them off under the surface. Try to catch them small, or at least before they go to seed. Avoid weedkiller: it can kill good insects and good plants, poison the soil and harm children.
- **Use weeds** for mulch or compost (but not if full of seeds).
- **Leave a patch of flowering weeds** to attract beneficial insects.



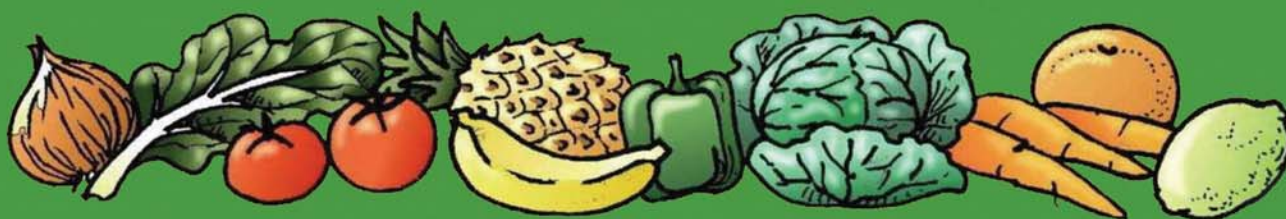
NOTES

REFERENCES

- Australian Broadcasting Corporation (ABC). 2004. Brisbane. www.abc.net.au/brisbane/stories/s780287.htm
- Battcock, M. & Azam-Ali, S. 1998. *Fermented fruits and vegetables: a global perspective*. FAO Agricultural Services Bulletin No. 134. Rome.
- Bercha, Robert, www.insectsofalberta.com
- Bruce, B. 1998. *Corn in the classroom*. Developing Countries Farm Radio Network Package 48, script 7. (a broadcast on Sligoville School, Jamaica)
- Burgess, A., Maina, G., Harris, P. & Harris S. 1998. *How to grow a balanced diet: a handbook for community workers*. London, VSO Books.
- Burgess, A. et al., 1994. *Community nutrition for Eastern Africa*. Nairobi, AMREF.
- Burgess, A. with Glasauer, P. 2004. *Family nutrition guide*. Rome, FAO.
- Cederstrom, T. 2002. *Learning to grow: How school gardens can provide food for education*. Food Forum Online, Issue 61, 3rd quarter. www.foodaid.org/ff2002.htm
- Chauliac, M., Barros, T., Masse-Rimbault, A.M. & Yopez, R. 1996. Jardins scolaires et education alimentaire en milieu andin. *Food, Nutrition and Agriculture* 16, pp.14-22.
- Chinanzavana, L. 2003. Inter-provincial campfire science exhibitions (internal report for Save the Children). Zimbabwe.
- Coleman, E. 1989. *The new organic grower*. Chelsea, Chelsea Green Publishing Company, Vermont.
- Cooks.Com Recipe Search. 2004. <http://www.cooks.com>
- FAO. 1993. *Food and nutrition in the management of group feeding programmes*. Rome.
- FAO. 1995. *Improving nutrition through home gardening: a training package for preparing field workers in Southeast Asia*. Rome.
- FAO. 2001. *Improving nutrition through home gardening: a training package for preparing field workers in Africa*. Rome.
- FAO. 2004. *Human energy requirements*. Report of a Joint FAO/WHO/UNU Expert Consultation. FAO Food and Nutrition Paper No.1. Rome.
- FAO Telefood. 2004a. *Zambia: helping AIDS orphans help themselves*. Telefood website www.fao.org/food/english/stories/projects
- FAO Telefood. 2004b. *Growing vegetables, cultivating minds*. Telefood website www.fao.org/food/english/stories/projects
- FAO. No date. *Rural processing and preserving techniques for fruits and vegetables*. Rome.
- FAO/WHO.1985. *Energy and protein requirements* Technical Report Series 724. Geneva.
- FAO/WHO. 2002. *Human vitamin and mineral requirements*. Report of a Joint FAO/WHO Expert Consultation. Rome.
- Food Works Organization. 2004. www.tworiverscenter.org
- Guy, L.A., Cromell, C. & Bradley, L.K. 1996. *Success with school gardens: how to create a learning oasis in the desert*. Phoenix, Arizona Master Gardeners Press (in cooperation with the University of Arizona).
- Heney, J. 2000. *Talking about money*, a guide for community support staff working with the FAO project Improving Household Food Security and Nutrition in the Luapula Valley of Zambia. Rome.
- Hessayon, D.G. 1976. *Be your own house plant expert*. Herts, UK, Pan Britannica Industries.
- Kidsgardening. 2004. website www.kidsgardening.com
- Kiefer, J. & Kemple, M. 1998 *Digging deeper: integrating youth gardens into schools and communities*. Montpelier, Food Works and the Common Roots Press (in partnership with the American Community Gardening Association).
- Mandela, N. 1994. *The long walk to freedom*. Boston and New York, Little Brown.
- Oregon State University, www.govlink.org
- Orenstein, P. 2004. Food Fighter, New York Times, 7 March.
- Pattanaik, B. 1998. "A school garden in India", Developing Countries Farm Radio Network, Package 50, Script 5.

References

- Payne, K.1998. Listening with respect: Issues of Class and Race in Working the Land. In *Digging Deeper*, pp 40-41.
- Sifri, Z., Ag Bendeck, M. & Baker, S.K. 2003. School Health Programmes in Burkina Faso: the Helen Keller International experience. In *Food, Nutrition and Agriculture* 33, pp.54-61.
- United Nations. 1989. Convention on the Rights of the Child, Office of the High Commissioner for Human Rights. Geneva.
- United States Department of Agriculture and <http://en.wikipedia.org>
- Urban Nutrition Initiative, 2001, Annual Report, Philadelphia, Pennsylvania.
- Valley Trust. 1995. *Valley Trust Nutrition Education Programme*. Valley Trust, Kwazulu-Natal, South Africa.
- Virginia State University. 2004. *Beneficial insects*. website www.ext.vt.edu/departments/entomology
- Wanasinghe, A.D. 2003. From School Garden to Home Garden. Integrated Food Security Programme. Trincomalee, Sri-Lanka. Technical Paper 29.
- Zambian Ministry of Agriculture Food and Fisheries. 2000. *Recipe book on Zambian traditional food*. Department of Field Services.



ADEQUATE NUTRITION AND EDUCATION are key to the development of children and their future livelihoods. The reality facing millions of children, however, is that these essentials are far from being met.

A country's future hinges on its youth. Yet children who go to school hungry cannot learn well. They have decreased physical activity, diminished cognitive abilities and reduced resistance to infections. Their school performance is often poor and they may drop out of school early. In the long term, chronic malnutrition decreases individual potential and has adverse affects on productivity, incomes and national development.

Schools can make an important contribution to countries' efforts to overcome hunger and malnutrition, and school gardens can help to improve the nutrition and education of children and their families in both rural and urban areas.

FAO promotes school gardens primarily as a platform for learning, as well as a vehicle for better nutrition. Schools are encouraged to create learning gardens that are moderate in size so that they can be easily managed by students, teachers and parents, but that also allow for the production of a variety of nutritious vegetables and fruits (and where possible, some small-scale livestock such as chickens or rabbits). Production methods are kept simple so that they can be easily replicated by students and parents at their homes.

In preparing this manual, intended to assist school teachers, parents and the wider community, FAO has drawn upon experiences and best practices derived from school garden initiatives all over the world. Classroom lessons are linked with practical learning in the garden about nature and the environment, food production and marketing, food processing and preparation, and making healthy food choices.



ISBN 92-5-105408-8



9 789251 054086

TC/M/A0218E/1/11.05/3000